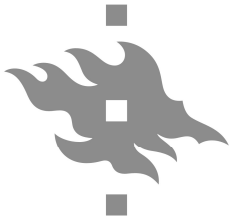

Master's thesis

Urban Studies and Planning

School segregation and declining educational outcomes: An analysis of urban and school segregation and the possibility of neighbourhood effects in upper comprehensive schools in Helsinki

Aino Suomalainen

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Supervisors:

Venla Bernelius
Teemu Kemppainen

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Tiivistelmä – Referat – Abstract

This Master's thesis studies the mechanisms connected to negative changes in educational outcomes in upper comprehensive schools in Helsinki. What are the factors associated with negative changes in educational outcomes of individual students during the transition from 7th to 9th grade? There is an increased socioeconomic and ethnic segregation in Helsinki Metropolitan Area, and the differences between schools' levels of success have also been growing throughout the 21st century. There is little research on combining schools and city development in Finland. The aim is to examine is there an association between decreasing individual educational outcomes and socio-spatial or school segregation, and to look at what is the role of individual factors and social context in decreased educational outcomes. Studying pupils and schools is a good way to capture local processes of differentiation and neighbourhood effect, because children and youth are especially prone to neighbourhood and school effects due to their ongoing process of socialization, localized lives in their neighbourhood and shared institutions, such as school.

This study is conducted quantitatively, and the main method in this study is hierarchical linear regression. The data is from Metropolitan Longitudinal Finland research, which studies the success and wellbeing of pupils in upper comprehensive schools in the Helsinki Metropolitan area. The study was conducted during the Fall of 2011 and the Spring of 2014 tracking the same cohort when the pupils were in their 7th and 9th grades.

The results suggest that there are no differences found between schools, but some of the qualities describing neighborhoods indicate that some neighbourhood effect might be found. There are indications that pupils with decreased educational outcomes are more likely to study in schools that are located in low income areas than higher income areas. Also, for pupils with decreased educational outcomes, attending a school that is located in Northern or Southeastern Great districts is more likely than attending a school in Eastern Great district. Based on the results, pupils with negative change in educational outcomes are more likely to spend time with friends of own area than with school friends. Boys have a bigger risk for a negative change in educational outcomes than girls, and the change of school is connected to decreased educational outcomes. Mother's education and immigration background was not found to have connection with decreased educational outcomes. Decreased educational outcomes have a connection with a low parents' pedagogical ethos, but no connection with peers' pedagogical ethos was found.

The results are significant from the perspective of urban and educational politics and planning. The indications that the educational outcomes in upper comprehensive schools in Helsinki are differentiated in neighborhood level for example between Great districts, and in individual level between genders, challenge the goals of equal educational opportunities. Also, urban planning should be targeted to prevent socio-spatial differentiation of neighborhoods, in order to combat differentiation in schools' composition of pupils.

In future research, the starting level of educational success could be studied more closely- does decrease in educational outcomes implicate different educational paths for pupils that start with high starting level than pupils that have lower starting level in the beginning? This study provided information that there are no differences between schools found currently, but the processes of differentiation are not stable, so the processes should be observed continuously.

Avainsanat – Nyckelord – Keywords
segregation, school choice, school differentiation, neighbourhood effect, peer effect, pedagogical ethos, educational outcomes

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Table of Contents

1 Introduction

1.1 Purpose of the study

Urban segregation refers to undesirable spatial segregation where certain demographic groups are overrepresented in one area and underrepresented in other areas (e.g. Massey & Denton, 1988). Socio-spatial segregation in many European cities has continued to increase (Andersson & Kährik, 2015; Musterd, 2017; Marcińczak, Musterd, Van Ham, M & Tammaru, 2016). Socio-spatial segregation in Helsinki Metropolitan area has been growing as well since the 1990s, despite decades of political efforts to combat socio-spatial segregation (Kortteinen & Vaattovaara, 2015). However, the situation is still quite balanced when compared to other major cities internationally (Kortteinen & Vaattovaara, 2015).

In Helsinki Metropolitan area there are no neighbourhoods that have absolutely weakened in terms of wellbeing. However, the most advantaged neighbourhoods have been developed faster, which further grows the differences between areas (Vilkama, 2014; Helsinki's present state and development, 2019). Simultaneously, different layers of disadvantage, such as low levels of income, unemployment and low levels of education, have been accumulating to the same neighbourhoods. (Helsinki's present state and development, 2019). Increased socioeconomic and ethnic differentiation have been observed also in other urban regions in Finland as well, in Turku and Tampere regions (Kauppinen & Vaalavuo, 2017).

In the last decade, noticeable increases in ethnic segregation have occurred (Vilkama, 2014). The share of immigrants and their children born in Finland has been growing considerably in the previous decades causing an effect in the population structure of Helsinki. However, the relative magnitude of immigration is considerably lower in Finland compared to other Nordic or European countries, despite having the same patterns of segregation related to ethnicity (Stjernberg, 2019).

In international literature, schools are deemed interesting from the point of view of segregation processes (e.g. Boterman, Musterd, Pacchi & Ranci, 2019). One of the mechanisms connected to segregation processes is selective migration by moving into certain neighbourhoods to be able to choose a nearby school (e.g. Butler & Hamnett, 2007; Owens, 2017). In Finland school choice varies between municipalities. For example, in Helsinki families can choose a school outside of their own catchment area, if there are available places in the desired school. In Helsinki, local schools have an effect in the choice of residential area. For example, parents may choose to avoid certain schools.

These moving choices are connected to segregation processes and moving patterns can further make school differentiation stronger: some schools are partly even more segregated than the neighbourhoods they are located in (Bernelius, 2013). The same pattern that school segregation is higher than residential segregation has also been found in other European cities and in the US cities (Boterman et al., 2019).

Besides differentiated neighbourhoods, differences between schools' levels of success (osaamistaso) nationally and in Helsinki Metropolitan area have been growing throughout the 21st century (Kuusela, 2010). The PISA 2018 results show that there are no significant differences between schools, but differences between pupils have grown and are the biggest thus far in Finland's PISA tests (Leino et al., 2019). It is a worrying development that the socioeconomic background of pupils has a growing effect on results. It seems that the results of the students with the weakest educational outcomes are even weaker than previously (Leino et al., 2019). Regionally in Finland, the variation between students is the most significant in Helsinki Metropolitan Area (Kuusela, 2006; Leino et al., 2019). Considering gender, boys are in especially vulnerable position with particularly weakened results (Leino et al., 2019).

The trends of school differentiation create challenges when trying to achieve equity in schooling. In Finland, there has traditionally been a strong egalitarianism in terms of schooling. Everybody has a right to receive a decent schooling, and all of the schools are seen as good enough for everybody, a "social-equality discourse" (Simola, Kalalahti, Kauko, Sahlström & Varjo, 2017). Furthermore, egalitarianism is mentioned in Article 2 of Finnish Basic Education Act (Perusopetuslaki), which emphasizes that education must be equal and promote equality in society.

Therefore, to compensate the differences between schools in Helsinki and to ensure equal educational opportunities (mahdollisuuksien tasa-arvo), a positive discrimination policy (positiivisen diskriminaation laskentamalli) has been in place since the turn of the century where schools that are located in the areas seen as the most challenging have received additional funding from the city (Lankinen, 2001). Positive discrimination funding is calculated based on the share of immigrants, parental education, income level and popularity of the school. Extra resources have proved to be effective and a positive impact on secondary school transition outcomes has been found (Silliman, 2017).

There is little research on combining schools and city development in Finland (e.g. Rimpelä & Bernelius, 2010; Bernelius, 2013). Studying pupils and schools is a good way to capture local

processes of differentiation and neighbourhood effect, because children and youth are especially prone to neighbourhood and school effects due to their ongoing process of socialization, localized lives in their neighbourhood and shared institutions, such as school (Pinkster & Fortuijn, 2009).

Similarly, there is not much research on how socio-spatial segregation affects pupils or families in the context of European or Nordic countries. In the US, it has been demonstrated that growing up in a disadvantaged area produces independent effects on educational outcomes, which is reflected to adulthood by lower educational level and lower income (e.g. Sampson, 2012). However, it is unclear how neighbourhood or school effects take place in the context of a welfare state with lower socioeconomic differences, such as in Finland (Eerola & Saarimaa, 2019).

Socio-spatial segregation is seen in children's and youth's wellbeing first because their everyday life is more closely attached to their surroundings, such as neighbourhood and the community surrounding them (Rankin & Quane, 2002). Children and youth also spend more time in their neighbourhood than adults (Rankin & Quane, 2002). Many of the everyday contacts of children are in local institutions and activities such as at school and in local neighbourhoods. Also, pupils at upper comprehensive school are at an suitable age (13-15 years old) for studying peer effect, since peer effects are typically strongest in youth of their age (Rankin & Quane, 2002).

1.2 Research questions

This study looks at the negative change in educational outcomes (osaamismuutos) in upper comprehensive school and the mechanisms connected to the change. The negative change in educational outcomes in this study refers to the negative change in test results from 7th to 9th grade, which will be explained in chapter 3 in more detail.

In the individual level, the change in educational outcomes affects later educational path. The school success of basic education is reflected on the individual options and choice of upper secondary level education, and through it to the later education path (e.g. Kilpi-Jakonen, 2017). Attachment to society and working life is strongly linked to completed education.

Based on earlier research, schools in Helsinki Metropolitan area are differentiated. From the point of view of equality of education, it is important to examine the mechanisms that are connected to school success as they can have an overall effect on later educational path. This study will look at the

structural and individual level factors to explain negative change in educational outcomes- whether neighbourhood or school have an effect on the grades, or is it more strongly connected to individual characteristics, such as parents' background or peer effects.

My research questions are following:

1. What are the factors associated with the decline in educational outcomes of individual students during the transition from 7th to 9th grade?

2. Is there an association between decreasing individual educational outcomes and socio-spatial or school segregation? What is the role of individual factors and social context?

This study will be made quantitatively using the data of Metropolitan Longitudinal Finland research, which studies the success and wellbeing of pupils in upper comprehensive schools in the Helsinki Metropolitan Area (e.g. Rimpelä & Bernelius, 2010). The study was conducted during the Fall of 2011 and the Spring of 2014 when the pupils were in their 7th and 9th grades. Therefore, comparing change in school success from the start of upper comprehensive school to the end of comprehensive school is possible. This study will be conducted with multilevel linear regression models. The sample is wide and the data provides a variety of background information on the pupils.

There is no previous research in Finland on this topic where there would be as comprehensive information of the pupils as in this data. The data includes background information of the pupils and their family as well as of their attitudes and thoughts. Therefore, the data provides exceptionally unique opportunities to examine the effects of neighbourhood and school differentiation seen already in the pupils age of comprehensive school.

In this thesis, I will start by looking at the theoretical perspectives of different phenomena linked to the research topic, such as segregation, neighborhood effect, school differentiation, and social context. After looking at previous research, I will introduce my research methods and consider the trustworthiness of the study as well as research ethics in chapter 3. Next, in chapter 4, I will present the results I estimated with hierarchical linear multilevel regression models, and in chapter 5 finally analyze the results in the light of previous research and consider their practical implications as well as suggestions for future research.

2 Theoretical background

2.1 Residential segregation

In urban research, segregation often refers to undesirable spatial and residential segregation where certain demographic groups are overrepresented in one area and underrepresented in other areas (e.g. Massey & Denton, 1988). Segregation research in the US has a strong racial dimension. Other classical dimensions of segregation are socioeconomic background, stage of life and other demographic differences (e.g. Boterman, Musterd, Manting, 2020; Hamnett, 2001). However, understanding of segregation can be complemented with a combination of dimensions of social positions, such as educational attainment or employment sector (Boterman et al., 2020). Dimensions often occur simultaneously, if for example immigrants with low income are concentrated in their own areas.

In classical Finnish sociology, Allardt proposed a different perspective to define segregation: segregation can also be defined more by the qualities of an area, rather than demographic composition, e.g. defining a minimum level of services and living space. Areas can be unique and different, but all of them should have a minimum level of services and living space. (Allardt, 1992).

However, it should be remembered that all segregation is not always unambiguously negative and that segregation can be voluntary as well. For example, research looking at ethnic segregation describes that there are some factors that support concentrations of ethnic groups (Bolt, Burgers & van Kempen, 1998).

There are multiple concepts regarding spatial differences in the discussion concerning segregation, both internationally and in Finland. The concepts include e.g. segregation, differentiation and polarization. The concepts are closely connected together, but their application is not established. The meanings connected to the different concepts used in literature varies depending on the research question and perspective. Segregation has not been a commonly used concept in Finnish urban research in the past. The term segregation has a negative connotation, might be deemed political and can be too powerful in the Finnish context as segregation is not as strong in Finland as in other parts of Europe or the US.

In contrast, the concepts more often used in Finland are differentiation (alueellinen eriytyminen) and erilaistuminen. These concepts are not as strong and do not have such a strong negative connotation as segregation has (Rasinkangas, 2013). Differentiation as a concept is also not seen as political as segregation. Also, differentiation can be part of a natural development of city structure where city structure can have unique areas with varying social mosaic (Vilkama, 2011, 25).

I chose to use the concept of segregation in this study, because there are signs of involuntary segregation on Helsinki Metropolitan area (e.g. Helsinki's present state and development, 2019). Moreover, in recent Finnish research, the concept of segregation has been used (e.g. Kortteinen & Vaattovaara, 2015; Saikkonen, Hannikainen, Kauppinen, Rasinkangas & Vaalavuo 2018; Helsinki's present state and development 2019).

Socioeconomic segregation in many European cities has continued to increase (Musterd, Marcińczak, van Ham & Tammaru, 2017). By international comparison, Helsinki is quite balanced but still segregation has been dramatically growing and there are signs of alarming developments. There are spatial concentrations of poverty in Helsinki Metropolitan area which have low median income and low levels of employment and education (Vilkama, Lönnqvist, Väliniemi-Laurson & Tuominen, 2014). These concentrations, described as pockets of poverty, have been growing since the 1990s and they have become significantly concentrated in one macro area (Kortteinen & Vaattovaara, 2015; Vilkama et al., 2014).

When looking at more closely, in Helsinki and in the whole of Helsinki Metropolitan area there are no neighbourhoods that have absolutely weakened, but the most advantaged neighbourhoods have been faster to develop in terms of wellbeing, which has the effect to grow differences between areas (Vilkama et al., 2014; Helsinki's present state and development, 2019). Simultaneously, different layers of disadvantage, such as low income level, unemployment and low levels of education, have been cumulated to same neighbourhoods. These neighbourhoods have been left behind in city development especially when examined all the way from 2000s. However, in some areas, the socioeconomic structure has been improved due to additional building development, such as in Myllypuro in Eastern Helsinki (Helsinki's present state and development, 2019).

It was found already in 2011 that there is a new ethnic dimension in the segregation processes in Helsinki Metropolitan area: the share of residents with immigrant background has been growing

especially in disadvantaged neighbourhoods (Vilkama, 2011). In the last decade, steepening of ethnic segregation has been noticed. The share of immigrants and their children born in Finland has been considerably growing in the 2000s and this has had an effect on the demographic structure of residents in Helsinki. Spatial differences between the ethnicity of children are big as well (Helsinki's present state and development, 2019). However, the magnitude of immigration is much smaller in Finland than in other Nordic countries or in Europe (Stjernberg, 2019).

Social mixing is seen as an important policy which is implemented either by directing a proportion of apartments in attractive residential areas for people with low income, or by giving people with low income earmarked support which they can choose to use for the rents in expensive residential areas (Eerola & Saarimaa, 2019). Furthermore, by building a diverse building stock, socially diverse neighbourhoods can be formed. In Finland, social mixing is typically aimed by building ARA housing (The Housing Finance and Development Centre of Finland) evenly across all residential areas to develop socioeconomically diverse neighbourhoods (Eerola & Saarimaa, 2019). However, despite of decades of political efforts to combat socio-spatial segregation, spatial differences have been growing since the 1990s (Kortteinen & Vaattovaara, 2015).

When looking at differentiation in a regional level in Finland, it has been observed in urban regions that the urban core is more disadvantaged than the regional fringes. Unemployment rates and the share of people with low income are higher e.g. in Helsinki than in the fringe municipalities of the city (Stjernberg, 2019). Increased socioeconomic and ethnic differentiation has been observed also in other urban regions in Finland as well, in Turku and Tampere regions (Kauppinen & Vaalavuo, 2017).

The socio-economic decline that is already in some residential areas is further reinforced by selective migration. Selective migration might lead to a self-perpetuating downward development where certain areas are being favored and others rejected based on public perceptions of neighbourhoods or housing estates (Bernelius, 2013). Today, selective migration is one of the central drivers of segregation in the major urban regions of Finland (Vilkama et al., 2014; Stjernberg, 2019). Selective migration is connected to school choices as well- with locating to certain neighbourhoods, parents are often able to locate their child into a desired nearby school and to have an environment for their children that they perceive as suitable. Selective migration in school context has been noticed internationally (Butler & Hamnett, 2007; Owens, 2017; Boterman et al., 2019) and in Finland (Dhalmann, Vaattovaara & Vilkama, 2013; Bernelius & Vilkama, 2019).

The development of segregation does not seem however to abate in the future, e.g. due to selective migration that was discussed above. Most of the housing estates' socio-economic profile seems to persist over time in a self-perpetuating process, so similar trajectories as before are expected- there is path-dependency to be seen (Stjernberg, 2019).

The effects of segregation reflect into various levels: to societal institutions, such as schools, and to families and individuals. Socio-spatial segregation can also reflect to the wellbeing and health of individuals. Therefore, areas have differentiated needs for public services, and the composition of children in schools and daycares varies between areas. Also, segregation can have an effect on perceived feeling of security (Helsinki's present state and development, 2019).

Schools are interesting from the point of view of segregation processes. Schools act as important local institutions where the "final results" of segregation and the demographic structures are reflected. Parents might have an effect to selective migration by avoiding or pursuing into certain schools, which is then connected to segregation processes in a bigger scale. Moving to certain neighbourhoods to ensure getting into certain schools' admission area can lead to increased costs of housing in the area, which means that the access of people with low income to certain neighbourhoods and thus into schools' admission areas becomes more complicated (Harjunen, 2018).

2.2 Neighbourhood effect

Neighbourhood effect is an interesting topic from the perspective of school success- does the neighbourhood where one is living or attending school have any effect on educational or professional outcomes in life? There is plenty of research on the topic of neighbourhood effect, as it has become a very popular topic in recent years. In this chapter, I will introduce neighbourhood effect in a general level, and then discuss it from the perspective of schools and school success.

Neighbourhood effect is often described that disadvantaged neighbourhoods have an effect on an in individual behaviour and opportunities in life, for example employment, educational outcomes, health and criminal activities (Sampson, 2012). The factors connected to residential environment that have an effect to residents can be divided into separate groups. The demographic structure of an area can have straight effects, or there can be effects related to mutual relationships with residents, or other effects connected to residents living in the area, such as institutions or infrastructure of the area (Kauppinen, 2004, 13). The aspects of race and ethnicity are closely connected to neighbourhood effect, especially in the US (Andersson, Hennerdal & Malmberg, 2019).

There are different causal pathways that might lead to neighbourhood effects, such as social-interactive mechanisms, environmental mechanisms, geographical mechanisms and institutional mechanisms. However, there is not much research on these different causal mechanisms to make any proper conclusions on how these affect individual outcomes (Galster, 2012).

Neighbourhood level social processes are an important part of the mechanisms of neighbourhood effect (Sampson, 2012, 369). The cultural and social mechanisms of a neighbourhood have long- term effects on wellbeing and disadvantage. One of the main concepts which are part of the theoretical discussions in neighbourhood effect is collective efficacy which refers to social cohesion and shared expectations of control between people in neighbourhoods (Sampson, 2012, 369). High collective efficacy of a neighbourhood is connected to residents' wellbeing (Sampson, 2012, 368).

Perhaps the most known and one of the largest randomized controlled research on neighbourhood effect is Moving to Opportunity program which was conducted in the US in the 1990s. The purpose of the MTO program was to help poor families from disadvantaged areas to have higher quality of life by supporting their move to a more advantaged area by providing coupons as a financial support.

The idea was to measure whether the life of families living in disadvantaged areas would change for the better, if they would move to a more advantaged area. However, there were difficulties in the project and the measured effects were quite modest. Families that moved to better areas as well as families that stayed in disadvantaged areas, did not manage to e.g. improve their financial situation. Thus, the results of the program should be evaluated with caution (Sampson, 2012, 273-278). There is critique on the MTO program that the experiment is based on a causal assumption that it is the neighbourhood itself that causes poverty, and the assumption does not address any structural factors driving to poverty (Slater, 2013). The studies that have applied the results of the MTO program do not form any cohesive results on the effects of the experiment.

There are few comprehensive studies on neighbourhood effect in the Finnish context. In Finnish research on neighbourhood effect, there has e.g. been found that living in an area with high unemployment reduces the chances of those who have experienced unemployment to succeed in the labor market (Kauppinen, Kortteinen &Vaattovaara, 2009).

There is also critical discussion on the research of neighbourhood effect. For example, Slater (2013) points out that structural factors behind neighbourhood effects are often not considered. A belief in causal mechanisms is a governing paradigm: “Where you live affects your chances in life misses the key question of why people live where they do in cities”. (Slater, 2013). Fundamental structural questions, such as injustices at housing market or other structural factors producing inequal outcomes and chances in life are not often taken into consideration in the research (Andersson & Musterd, 2005, 386-387; Slater, 2013). Also, when studying neighbourhoods, it should be remembered that not all poor or rich neighbourhoods are homogenous. Neighbourhoods vary for example in their quality of life or social organization (Rankin & Quane, 2002). Similarly, not all schools in disadvantaged or advantaged areas are alike. Therefore, the possible mechanisms affecting neighbourhood should be carefully thought- neighbourhoods have different characteristics, and therefore depending on the neighbourhood, the mechanisms of neighbourhood effect might operate in different ways (Nieuwenhuis & Hooimeijer, 2016).

When generalizing research results, it should be remembered that contexts are different. For example, the results from the MTO program or other US research might not fit in the Nordic welfare countries, because the differences in public services and social security are significant, and therefore it is difficult to evaluate whether neighbourhood effect can appear in Finland as well (Eerola & Saarimaa,

2019). Also, the effects of neighbourhoods might be heterogenic -results of the MTO program show that neighbourhood effects are stronger depending on how long children have been subject to a harmful environment (Chetty & Hendren, 2015).

Studying neighbourhood effects is difficult, because often it is difficult to develop quasi experimental research design, since usually people can choose in which neighbourhood they want to locate themselves. Trustworthy quasi experimental research show that neighbourhood effects in certain environments can be significant. For example, (Chetty & Hendren, 2015) developed quasi experimental research evidence, where causal effects were studied in county level in the US. The results show that children with low income parents living in counties that have e.g. less concentrated poverty, less income equality and better schools, have better outcomes in their lives (Chetty & Hendren, 2015).

The effect of neighbourhood varies between demographic groups (Andersson & Kährik, 2015). Childrens' and youths' life is more local than adults' lives which makes them more prone to neighbourhood effects. Many of the everyday contacts of children are in local institutions and activities such as at school. Children and youth also spend more time in their neighbourhood than adults (Rankin & Quane, 2002). Because young people's lives are focused to their home and neighbourhood and of their ongoing process of socialization, they are more easily affected by potential negative effects in the neighbourhood (Pinkster & Fortuijn, 2009). This is why it is very interesting to make research on schools and pupils from the perspective of neighbourhood effect.

There are multiple international studies on neighbourhood effect and child or youth development which show that the socioeconomic status of the neighbourhood is associated with certain educational outcomes or achievements for youth- living in an advantaged neighbourhood is related to having advantageous educational outcomes, and conversely living in a disadvantaged neighbourhood is related to having decreased educational outcomes (e.g. Holloway & Mulherin, 2004; Andersson & Subramanian, 2006; Nieuwenhuis & Hooimeijer, 2016). Furthermore, it seems that neighbourhoods and schools produce effects independent of youths' own backgrounds, which effect youth's attitudes towards school and success in studies and educational path (Ammermueller & Pischke, 2006; Brattbakk & Wessel, 2013; Andersson, Hennerdal & Malmberg, 2019).

It is an open question whether there is an effect of neighbourhood or school on adolescents' educational outcomes in the Finnish context. Some studies have been conducted but not very recently (e.g. Karisto & Monten, 1996; Karvonen & Rahkonen, 2002; Kauppinen, 2004). For example, Kauppinen (2004) found that in the neighbourhoods with a large share of highly educated adults, youth attend high school more often than expected, based on their own family background. This is affected by spatialized pedagogical ethos. Also, it was found that the educational structure of the neighbourhood population have an effect on completing upper secondary school: in neighbourhoods with a high education level, finishing upper secondary school is more common than in average neighbourhoods. However, the effect was nonlinear- neighbourhoods with a low educational level did not deviate from the average neighbourhoods (Kauppinen, 2004). Finland's PISA tests have not shown any clear school effect either (Leino et al., 2019). The significance of school level factors, such as the size of school or classes and resources, has always been very low in Finland (Rautopuro & Juuti, 2018, 92).

2.3 School differentiation

Besides socio-spatial differentiation, there is a growing school differentiation in Finland: differences between schools' levels of educational outcomes nationally and in Helsinki Metropolitan area have been growing throughout 21st century (Kuusela 2010; Lappalainen 2011). Helsinki Metropolitan Area has the most of the best and worst performing schools (Jakku-Sihvonen & Kuusela 2002). Therefore, the differences between students' educational outcomes are remarkably larger in Helsinki Metropolitan Area than in other parts in Finland (Kuusela 2010).

There is a need for additional research on the mechanisms that connect spatial development and school segregation in the Finnish context, as well as for research on the individual-level effects that school segregation may have in the Finnish education system (e.g. Karisto & Monten, 1996; Rimpelä & Bernelius, 2010; Bernelius 2013). In this thesis, I will concentrate specifically to the group which experiences a relative drop in educational outcomes during lower secondary school to gain more understanding on the possible mechanisms for segregation-related neighbourhood effects within basic education.

PISA tests show recent results in the school success of Finnish pupils. Traditionally Finnish students have achieved excellent results in PISA tests and have had low differences between their educational outcomes, but now it seems that the differences in educational outcomes in Helsinki are even bigger than in some other PISA countries (Leino et al., 2019). Nationally, in PISA 2015 tests the differences between the best and the weakest schools in Finland increased worryingly. In all of the three subjects in PISA tests (literacy, mathematics, natural science), the results of pupils in Helsinki Metropolitan Area were better than in other regions in Finland. Growing differentiation between regions in Finland was found, especially when comparing Helsinki Metropolitan Area to other regions. Also, the differences between urban and rural schools were growing- city schools succeeding better (Rautopuro & Juuti, 2018).

However, PISA 2018 tests results show that the differences between regions in Finland do not have predictive power no longer. The variance between schools nationally has grown since 2006, but the changes are so small that they are not statistically significant. (Leino et al., 2019). Thus, the results of the Helsinki Metropolitan Area of 2015 appear to be exceptional in the history of PISA in Finland. However, the variation in PISA results is still greater in the Helsinki Metropolitan Area than in other

regions in Finland - according to previous PISA tests, the best and least successful schools are still located in the Helsinki Metropolitan Area – thus, some differentiation can be observed in the Helsinki Metropolitan Area (Leino et al., 2019).

School differentiation seems alarming since in Finland, there has traditionally been an ethos of equal education opportunity where everyone should have the right to education regardless of their background and that background should not predict attendance or educational outcomes (e.g. Varjo & Kalalahti, 2016). Education is seen as an important thing to promote equality. A change in school politics occurred during the neoliberal turn in 1980s and 1980s, after which equal educational opportunities includes, along with equality, that individual possibilities for education should be offered (Kalalahti, 2012). One of the manifestations on this change in equal education ethos was that education should have school markets. One of the expressions of this change is school choice policies (Kalalahti, 2012). During the 1990s there was a significant change made in bigger cities in Finland when the policy of school choice was introduced (Seppänen, 2003). Previously, schools were indicating spots for pupils into local schools but now pupils are able to apply for other schools than the local schools as well and so the schools were partially now able to choose their pupils. The purpose of this politics was to support schools to provide specialization for pupils and to make supply of schooling more diverse, and to improve learning possibilities of pupils.

Trends towards neoliberalism of the school systems have been growing in Europe and US in the last two decades as well. Free school choice mechanisms have been introduced, and therefore private schools have become more popular. With this de-regulation and freedom of parental choice, consequently, segregation in schools and residential socio-spatial segregation has increased (Boterman et al., 2019) and educational equality has been compromised (Andersson, 2019).

In Finland, school choice policy varies between municipalities. In Helsinki, the policy is that families can choose a school outside of their own catchment area, if there are available places in the desired school. The politics of school choice in Helsinki was about to produce positive differentiation so that pupils would have different emphasis in schools to choose from. The purpose was not to create competition between schools (Seppänen, 2003). However, with this positive differentiation, new school policy seems to create negative social differentiation (Bernelius, 2013). As discussed in the introduction, in Helsinki, to compensate differences between schools and to ensure equal opportunities, there has been a policy of positive discrimination (positiivisen diskriminaation

laskentamalli) from the 2000s where schools that are located in the areas seen as the most challenging have received additional funding from the city (Lankinen, 2001).

Residential mobility increases school and residential segregation. Residential mobility is the most crucial way for getting into a particular school, even if parents can also use the possibility of school choice to apply their children to a different school than their local one. However, parents often make moving decisions based on school catchment areas to be located in certain neighbourhoods and most importantly schools, even if the quality of schools is high throughout Helsinki Metropolitan area (Bernelius & Vilkama, 2019). With the change of school policy in Finland, new possibilities for middle class have emerged to ensure middle class school culture for their children (Kosunen, 2012).

Therefore, schools have an effect in moving choices, for example when parents want to avoid certain schools and neighbourhoods by locating elsewhere. These mobility patterns are connected to segregation processes and moving patterns can further make school differentiation and socio-spatial segregation stronger since the direction of the move is from disadvantaged areas to advantaged areas (Bernelius & Vilkama, 2019). For this reason, some schools are partly even more segregated than their neighbourhoods (Bernelius, 2013).

2.4 Social context

2.4.1 School and peer effect

Contextual effects are used as a general concept to describe various contexts which produce different effects. The concept of neighbourhood effect is typically used to describe widely different individual effects that are originated through neighbourhood, but for example school effect or peer effect are more particular concepts that refer to the effects that are transmitted especially through peers, e.g. in school environment. Peer and school effects are connected to neighbourhood level as well.

Peer context is one of the contexts that act as a strong predictor for youth outcomes (Pinkster & Fortuijn, 2009). Peers can have an effect on educational attitudes and outcomes in various contexts. As stated previously in this study, youth is especially vulnerable time in the development of socialization, thus peers have an important influence on adolescents. (e.g. Rankin & Quane, 2002; Pinskter & Fortuijn, 2009). Studies show that peer groups, at school and free time, can have an effect e.g. to attitudes towards education and educational outcomes (e.g. Epple & Romano, 2011). Often members of peer groups are similar in their academic orientation and school success (Kiuru, 2008). It might be that youth choose peer groups whose educational attitudes are corresponding to theirs or that peer groups only accept members who share similar attitudes. It is also possible that youth socialize to educational attitudes in their peer group(s) (Kiuru, 2008). Also, if the relationship between parents and children is distant or has conflicts, peer groups can be an even more important context than for children with more balanced relationship with parents (Järvinen, 1999).

Karvonen & Rahkonen (2002) studied negative attitudes towards education and found that boys were more negative towards school than girls and that lifestyle was connected to negative pedagogical ethos: those spending their free time time at “streets” had the most negative pedagogical ethos. Based on their study, negative pedagogical ethos is most influenced by peer groups- parents or grades do not have as strong effect. Antipedagogical ethos is bound to area: youth attending school at the same area can be connected by similar negative or positive pedagogical ethos (Karvonen & Rahkonen, 2002).

Research shows that the connection between peer groups and educational outcomes is stronger during upper comprehensive school whereas the effect of peer group is not as strong during lower

comprehensive school when pupil's own background has more effect on educational outcomes (Bernelius, 2013, 71).

In contrast to peer effect, school effect refers to variation in school-specific learning outcomes related to school's social background factors which are not reversible to differences in students' own background factors between schools (Bernelius, 2013). For example, school effects can appear as differences in learning outcomes, which are related to a school's socioeconomic or ethnic background (Bernelius, 2013). School effect might also be called class or peer effects and they thus can refer to peers' parental background (Andersson, Hennerdal & Malmberg, 2019), and therefore these concepts can have parallel meanings.

School effect can occur through peers e.g. when another pupils' occupancy in class effects to another pupil's performance (Epple & Romano, 2011). The mechanisms can happen e,g, if one of the students is active and asking questions during the lecture, which can be beneficial for all the pupils in the class, or it can motivate teacher to develop his/hers teaching to more clearly. In contrast, if there are pupil(s) in the class who cause disturbances in class, teachers' resources can be allocated too much towards keeping peace and less towards teaching (Epple & Romano, 2011). In schools with lots of students with behavioural problems, school effect might be especially negatively strong.

School effect might also appear in class room level where grades and attitudes might be influenced by the composition of the class. For example, Ammermueller & Pischke (2006) found that if there are skillful peers in the same group, learning results increase. In UK, it was observed that at streamed schools where students were divided into groups based on their talent in each subject so the groups were quite homogenous. In the top streamed groups there was a strong positive effect of peers on the grades and being in the lowest ability streamed groups has a negative effect on grades, thus the effect of peer group (Robertson & Symons, 2003).

There are similar results on peer groups at school context in Finnish research as well. Bernelius (2013, 143) found out that pupils whose parents have low level of education and are studying at schools that perform the best, achieve better educational outcomes in these schools than in other schools. Their attitudes towards studying are clearly also more positive than pupils with the same background studying at more weakly performing schools. In comparison, pupils whose parents have high level of education and are studying at schools that perform worst get significantly weaker grades than in other

schools (Bernelius, 2013). One explanation might be that the children of highly educated parents are especially prone to peer effects (Bernelius, 2013).

Similar results were also observed in Välijärvi & Malin's (2005, 146-147) study on PISA results where it was found that the socioeconomic background of schools in PISA countries can have an effect on educational outcomes- in schools with pupils with high socioeconomic background, the students with lower socioeconomic background can perform better than expected by their background. This was explained by the work environment and attitudes towards studying which might be more positive than in other schools, also the higher requirement by teachers might make students focus more towards studying (Välijärvi & Malin, 2005, 146-147).

2.4.2 Hobbies and free time

Peer context is placed in different contexts, such as in hobbies. Hobbies are one of the factors that determine the peer groups of children and therefore their attitudes and values. Hobbies might also support studying, such as sport or music activities. Differentiated possibilities for hobbies also increase inequality in education (Hakovirta & Rantalaiho, 2012, 65- 66).

The financial resources of parents structure mainly the ways how their children are spending their free time and what kind of social situations and spaces their children are attending. Children themselves notice how their ways to spend free time differ based on the economic situation of their parents: e.g. poorer children are thought not to have any organized hobbies (Hakovirta & Rantalaiho, 2012, 65 - 66). Therefore, when comparing families with different socioeconomic statuses, everyday life of (upper) middle class is not as localised with having hobbies and networks outside of the area than lower class families (Knuuti, 1982). Similar results were found in Järvinen's study (1999), where Finnish youth and their differentiated ways of spending free time were examined. Based on that study, youth's ways and spaces where spending free time are somewhat differentiated, based on their family background. For example, youth with middle class parents have hobbies outside of home neighbourhood, whereas the hobbies of youth with working class parents are situated in nearby neighbourhood(s), and free time is spent with local friends at the home neighbourhood. However, there were also some youth groups that were not as strongly based on socioeconomic background, such as especially peer-oriented groups, whose free time was focused in commercial spaces and doing sports.

For children and youth who have parents with low socioeconomic status and are living in a disadvantaged area, the significance of local children and adults can be greater than for children with a more advantaged background. In certain suburbs, there is a familistic way of life (familistinen elämäntapa) where children or youth do not have contacts or responsible adults other than their own parents. In the absence of a network of adults, children and youth seek company and community from local youth, and relationships to other children become important. This can even lead to formation of gangs with their own subcultures, or other deviant norms and values. When the only community having adults is one's own nuclear family, pressure and expectations for parenting grow, and families' low resources might further build problems (Knuuti, 1982).

Other research as well supports this finding- if social networks overall are small, then social life in the neighbourhood becomes more significant (Ellen & Turner, 1997). There is also research showing that the factors affecting especially localized life is the composition of the household, plans on how long to live on the area, previous neighbourhood, socioeconomic background and ethnicity (Van Beckhoven & Van Kempen, 2003). The groups whose life is the most localized are children with their families, elder people and people with low socioeconomic status. (Van Beckhoven & Van Kempen, 2003).

In disadvantaged areas, it is also possible that parents might protect their children from neighbourhood effect and send their kids to a hobby outside of their neighbourhood so that their children would not have time to spend in their own neighbourhood and that they would have friends outside of it. Parent might think that "proper" hobby friends can have a protective effect from the neighbourhood perceived as harmful (Pinkster & Fortuijn, 2009).

2.4.3 Pedagogical ethos of parents and parenting strategies

Along with peers, parents have a strong role in youths' educational attitudes and outcomes. Pedagogical ethos is a central individual level phenomenon where attitudes are transmitted from parents or peers. Karisto and Monten (1996) define pedagogical ethos as a concept which indicates internalized willingness for education (kouluttautumishalukkuus). Positive pedagogical ethos is supporting youths' willingness for education whereas negative diminishes willingness for education. Pedagogical ethos is also connected to socioeconomic background: highly educated parents support their childrens' school attendance and positive attitudes towards studying more than parents with lower education (Kalalahti, 2012). Pedagogical ethos forms both at home and at school but also with peer groups and in other competing learning environments. Pedagogical ethos is present through the whole of the education path (Karisto & Monten, 1996).

In neighbourhood level, pedagogical ethos seems to vary based on area: in schools located in advantaged areas, children are more positive towards education, regardless of their parents' education and pedagogical ethos. Therefore, there is some neighbourhood effect found for pedagogical ethos (Karisto & Monten, 1996). Pedagogical ethos can act as one of the most central mechanism in neighbourhood effect through forming similar pedagogical ethoses locally in social networks and in institutions (Karisto & Monten, 1996).

Research shows that parents have different attitudes and expectations on their childrens' education which are connected to parents' educational backgrounds. Interaction between parents and their children is strongly connected on how parents' views on education transmit to their children. (Järvinen, 1999). Through their behavior, adults are communicating intentionally and unintentionally their own experiences of current opportunity structure(s) of studying and employment, which might have an effect to actions of their youth (Galster & Mikelsons, 1995). Families can support their childrens' studying for example by encouraging their children to adopt and commit to school culture, or parents might emphasize instrumental position, for example looking at grades closely. Parents' attitudes are reflected on how their children adapts and succeeds in studying (Kalalahti 2012).

However, there is also Finnish research that shows that the effect of parents' resources is not automatic, but parents' own actions have an impact on educational outcomes. A specific socioeconomic background might not determine how to value education, and for example inside working class there has been found different ways of valuing education (Järvinen, 1999).

Parents make perceptions of their social environment and shape their parenting practices accordingly. There are different strategies to prevent or moderate neighbourhood effect if the neighbourhood is experienced harmful (Pinkster & Fortuijn, 2009). Pinkster & Fortuijn (2009) state that "Concerns about neighbourhood risks for children are overwhelmingly social in nature". The concerns can include interaction with unsuitable peers, negative role models, risky strangers, or social problems in the area in general (Pinskter & Fortuijn, 2009).

There are different possible ways for parents to monitor their children's free time and school attendance. In disadvantaged areas, there might be a greater need for monitoring children. Parents monitoring their children closely can work as protecting or compensating their children from the effects of their neighbourhood. However, disadvantaged areas can also have parents who might face stress and do not have the resources to look after their children that closely (Nieuwenhuis & Hooimeijer, 2016). In more advantaged areas parents might not be very interested to monitor their children since they trust that the area is good and safe. On the other hand, parents in advantaged areas might have more resources to monitor their children's free time and school attendance than in disadvantaged areas (Rankin & Quane, 2002).

If living in a disadvantaged neighbourhood, parents might have a worry of their children having the wrong kind of peers in their neighbourhood. Therefore, parents might use different strategies to moderate negative neighbourhood influences in disadvantaged neighbourhoods: there are preventive strategies such as limiting interaction with neighbours or making spatial restrictions on where their children can play or hang out in the public space (Jarrett, 1997).

Promotive strategies include seeking better resources outside the neighbourhood (Jarrett, 1997). One example of a promotive strategy is that parents might regulate their childrens' peers by choosing a school outside of their neighbourhood to develop friends outside of their own neighbourhood, even if the local neighbourhood school is perceived being high quality (Atkinson, 2006). Highly educated parents are more likely to choose a non-neighbourhood school and distance them socially from local people (Pinkster & Fortuijn, 2009). Additionally, parents might send their kids to a hobby outside the neighbourhood so that their children would not have time to spend in their own neighbourhood and to have friends outside of the neighbourhood. "Good" hobby friends can have a protective effect (Pinkster & Fortuijn, 2009).

As a more dramatic solution, parents might also decide to move to other areas to protect and separate them from groups that they perceive different or potentially intrusive (Atkinson, 2006). This might actualize in e.g. gated communities where (upper) middle class or high income groups are relocating, to segregate themselves to a socially homogenic areas and neighbours (Atkinson, 2006). However, it should be noted that parents and neighbourhoods are heterogenous- parents have different backgrounds and differences on how they create restrictions for their children.

In this chapter, different neighbourhood level processes and contexts affecting educational outcomes have been discussed. There are many social contexts that are involved in shaping development and educational outcomes of children and youth, such as peer, family, school and neighbourhood context.

The effects of different contexts in individual and neighbourhood level might be modest, but together and simultaneously, their cumulative effect can be remarkable. If all the effects would be either only positive or negative, contextual effect as a whole might be strong, and reach to educational paths and outcomes (Furstenberg, 2000).

However, neighbourhood effects can be mediated by childrens' social contexts, such as family and peer context. Thus, neighbourhood effect might not affect children immediately, but family context can be a mediator or moderator by parenting strategies. Also, peers can act as mediating neighbourhood and family effects and thus affect outcomes of the youth. (Rankin & Quane, 2002)

There are few studies that study both residential and school context, but this study attempts to bring new information on this: does the differentiation of schools and neigbourhoods have an effect on decreased educational outcomes?

3 Data and methods

3.1 Data description

This study has been made with the data of Metropolitan Longitudinal Finland research, which studies the success and wellbeing of pupils in upper comprehensive schools in Helsinki Metropolitan area. The study was conducted in Fall 2011 and Spring 2014 when the pupils were in 7th and 9th grade, thus the data tracks the same cohort of students. The questions were the same in both years. Every municipality of Helsinki Metropolitan area (Espoo, Helsinki, Kauniainen, Vantaa, Kirkkonummi, Nurmijärvi, Sipoo, Tuusula, Vihti, Hyvinkää, Järvenpää, Kerava, Mäntsälä ja Pornainen) was part of this research. 129 schools participated in the study in 2011 when respondents were on their 7th grade. These same municipalities participated also in 2014, with 131 schools. There were 120 schools that were the same on both times of data collection. The response rate of the schools was from 61% to 97%. The lowest response rate can be explained by low response rate of the permission forms from the parents (Vainikainen et al., 2016).

In addition with MetrOP data, I will use data that brings additional background information of neighbourhoods and schools of Helsinki. The data includes variables such as the share of pupils with foreign language at the school, mean income of adults in the area and the share of adults having only basic education living in the area. Corresponding variables have been used in a statistical model in a positive discrimination policy that produces information of schools' operational environment and the composition of pupils in schools, which is used in the funding of schools in Helsinki to balance differences between schools.

Based on the data in use, the decision to which schools to include in the analysis was made. MetrOP data is of schools in Helsinki Metropolitan area and variables of Positive discrimination model describe the schools of Helsinki, so the data from MetrOP was set to include only pupils studying in the schools of Helsinki. The data used in this study includes schools in Helsinki that are both in MetrOP data and in Positive discrimination model, which were almost fully overlapping.

3.2 Method description

3.2.1 Factor analysis

For the purposes of regression analysis, I made factor analysis which I am using to condence information of variables based on my readings on literature. In addition, factor analysis helps to delete variables that do not fit well to this model. Factor analysis is a method that helps to find common features or dimensions, form a group of variables and helps to do data reduction into a few factors- in other words to find independent latent variables (Heikkilä, 2008; Nummenmaa, 2009, 396; Fabrigar & Wegener, 2012, 3-4). With explorative factor analysis, the variables that correlate with each other the most can be searched, and formed factors from them. This method helps to examine the variation between variables as much as possible (Heikkilä, 2008). The loadings of variables indicate how much the factors manage to explain the variation of variables in question. Loadings get values between –1 and 1. The closer the value of the loading is to 1, the stronger the variables gets a loading in the factor, thus explains the variation in the variable. In factor analysis, variables need to be at least in an interval scale or good ordinal scale, such as Likert scale (Heikkilä, 2008). The variables that I used in factor analysis have Likert scale.

In addition to factor analysis, there is also principal component analysis to help with data reduction. The essential difference between these methods is that factor analysis is based on a statistical model, and principal component analysis is not based on a statistical model but "decomposes the original data into a set of linear variables" (Field, 2005). I chose to use explorative factor analysis (EFA). In the end, PCA and factor analysis often produce similar results with large data (Field 2005; Fabrigar & Wegener, 2012).

In factor analysis, orthogonal and oblique rotation are used. Oblique rotation allows factors to correlate between each other (Oblimin, Promax) whereas orthogonal rotation makes factors independent of each other (Varimax, Quartimax, Equamax). Orthogonal rotation, such as Varimax, is recommendable due to its straightforward interpretation in common fairly exploratory research designs (Vehkalahti 2014, 103-104).

Good factor outcome is when factor explain as much as possible from the total variance of variables. There should be as few factors as possible. Ideally, the model should have small and big loadings

whereas average loadings should be as least as possible. Finally, factors should have a meaningfully interpreted content. These guidelines might conflict with each other, but it is recommendable to achieve an optimal solution that takes into account these guidelines as much as possible (Nummenmaa, 2008, 406-407).

Often, after factor analysis, the variables with the biggest loadings are formed into a single new variable (summamuuttuja). Factor scores could be alternatively used. Factor scores are more rarely used e.g. due to difficulties in interpretation (Heikkilä, 2008), although they can provide a better way to do data reduction than forming single variables (summamuuttuja) (Vehkalahti, 2014). These might include some measurement errors, but the interpretation of these is simpler than factor scores and the results between different research is easier than with factor scores.

In this study, I started with Explorative factor analysis. I had 16 Likert scale questions concerning the relationship of pupils with school, studying, peers and parents in the context of learning and pedagogical ethos, based on the study's theoretical background. As a method I used maximum likelihood and Varimax rotation. As a result, I got five different factors (Appendix 1). The factors included relationship with parents, parents' pedagogical ethos, and peers' pedagogical ethos, and two factors for learning orientation and achievement orientation. In the regression models, I chose to use two of these factors; peers' and parents' pedagogical ethos, based on the research design.

I tested the reliability of the factors and every factor had excellent reliabilities. The reliability coefficients (Cronbach's alfa) were 0.864 in peers' pedagogical ethos and 0.801 in parents' pedagogical ethos. The correlations between variables were satisfactory, the lower being 0.4. Thus, based on the reliability coefficients of Cronbach's alfa and correlations, the answers given to the questions in the study correlate well and are justifiable to combine into a one single new variable.

The new variable (summamuuttuja) of the parents' pedagogical ethos was formed by combining five different questions based on factor analysis (Appendix 1). The factors include how parent support and value studying, and if the respondent has good relations with his/her parents. Pedagogical ethos refers to pupil's impression and evaluation on their parents' attitudes towards education. The new variable of parents' pedagogical ethos includes following questions: My parents value schooling very much; my parents give their full support for my schooling; my parents appreciate very much that one

tries to learn and understand different things; my parents think I should try my best at school; relationship with my parents is very good.

The new variable of peers' pedagogical includes questions of My friends are interested in the things taught in school, My friends value the knowledge and skills taught in school, and In my friend group, schooling and learning are thought as important.

I treated Likert scale as a continuous variable when creating the new variables. There is a wide discussion on how Likert scales should be analysed and whether Likert scale can be used as a continuous or ordinal data. There are a lot of different perspectives- some view Likert scale as ordinal in nature. (Carifio, 2008; Norman, 2010; Harpe, 2015). In addition, in the final model, I treated the new variables as a continuous variable.

3.2.2 Operationalization of the negative change in educational outcomes from mother tongue tasks

The negative change in educational outcomes is measured by tasks in mother tongue. There were 18 tasks in the survey which contained questions of textual knowledge and interpretation, language proficiency, spelling. Additionally, the survey contained questions in other subjects as well, and questions measuring skills in learning to learn (oppimaan oppiminen).

I chose to use the tasks of mother tongue in this study. Examination of mother tongue is justifiable because it has been measured that the educational outcomes of mother tongue correlates strongly with other subjects at school such as languages and religion in Finland (Jakku-Sihvonen & Komulainen, 2004). That is why mother tongue is a good choice since its' level is connected to the succession in other subjects as well.

Mother tongue is a subject that is connected to educational outcomes in later educational paths. A high grade in mother tongue in the beginning of high school predicts higher overall success in baccalaureate exam (Harjunen & Rautopuro, 2015, 10-12). Thus, the level of success in mother tongue has effects on the future educational path.

In addition to the suitability for the research question, limitations in the data have affected the chosen subject: from the point of view of available data, mathematics had more missing values in the data, so choosing mother tongue would give more reliable analyses.

Overall, using tests that are the same for the whole cohort is seen as a reliable way to measure the level of success of pupils (Jakku-Sihvonen & Kuusela, 2002), thus this data provides excellent possibilities for research.

3.2.3 Calculation of the negative change in educational outcomes

As discussed in the previous subchapter, I chose to measure the negative change in educational outcomes by looking at the change in educational outcomes in mother tongue. The tasks of mother tongue have the same 18 questions in both years of measurement.

To form a new variable of change in educational outcomes, I made dummies according to if the answers are correct (1) or missing (99). I counted a sum for every respondent of correct answers from years 2011 and 2014.

Next, I counted how many missing answers every respondent have and made a sum for each respondent of these missing values, separately for years 2011 and 2014.

Then, to count change in educational outcome for each respondent, I subtracted the sum of change in educational outcome from year 2014 of year 2011 and added an if command which deletes missing values of each respondents. This equation was then divided by the number of mother tongue tasks and multiplied by 100 to get response rate. In this way, with if command, each respondent can have a maximum of 13 missing values, so that 25% of the tasks need to be answered. The limits for number of answers is quite loose, but with tighter limits the number of useful respondents would decrease too low. After that, I got a variable with a change and with 25% of correct answers. I will discuss about the missing values later in this chapter.

Finally, when the variable of change in educational outcome was made, I made a dummy from that variable to be used in the regression models. In group 1, there is 20% of the respondents whose educational outcomes has decreased the most, and the rest 80% of respondents are in group 0. Thus, every pupil included the data (after treatment of missing values) either belongs into group 0 or 1.

3.2.4 Multilevel models

The main method of this study is hierarchical linear multilevel regression. The field of multilevel analysis methods is quite disorganized and there is no established terminology. Multilevel methods have become common in recent years, but they are still quite rarely used in Finnish research in the field of social sciences. However, the research results gained from multilevel methods are usually very useful (Ellonen, 2006.) The basic models of multilevel analysis are mixed models, linear multilevel models and logistic multilevel models.

Using logistic regression models in the field of social sciences is common, but there is discussion on whether logistic regression actually is suitable for when studying outcomes with dichotomous variables, provoked by Mood's article (2010). Interpreting logistic regression has various problems- logistic regression might turn out problematic when comparing different logistic regression models, which is difficult and often done incorrectly (Mood, 2010). If the coefficient of correlation of the first dependent variables is changing when adding new variables to the model or changing models, it is difficult to compare different models because in logistic regression, the residual of individual level is rescaled to one every time individual level variables are added (Hox, 2010, 63-68). Also, coefficients depend on effect sizes and the magnitude of unobserved heterogeneity. Therefore, comparing coefficients is difficult (Mood, 2010). Moreover, log-odds and odds ratios might be difficult to understand. All in all, in logistic regression, interpreting estimates as causal effects should be done cautiously (Mood, 2010).

For my analysis, I chose to use linear regression, often called as linear probability models (LPM) to get results that would be more clearly interpreted than in logistic models. Linear random intercept models were estimated with a procedure Mixed in SPSS. In LPM, comparing coefficients is more straightforward (Mood, 2010) since it simplifies the estimation of risk differences instead of odds ratio in logistic regression. Also, LPM allows to compare coefficients from different models and samples and using different sets of independent variables, which logistic regression does not fit.

Certainly, there are issues to consider in LPM as well, such as heteroscedastic and non-normal residuals which can result in invalid standard errors or inefficiency (Mood, 2010).

With multilevel models, both individual level and group level differences and variances can be taken into consideration (Heck, Thomas & Tabata, 2012, 6). One- level models give valuable information of the relationships between different phenomena, but they can often be insufficient by the effects of social environments. This is seen in school research e.g. when one-level regression model is used to explain students' school success by their motivation- then motivation is seen only in individual level phenomenon and people are single individuals in their environment, e.g. peer effect on motivation is not considered. Also, traditional analyze methods are based on an assumption that observations are independent, and that variables from different levels cannot be put into the model simultaneously (Heck, Thomas & Tabata, 2012, 5-6).

Multilevel methods can offer solutions to aforementioned issues. Multilevel analysis permits to bring variables of different levels to into the same model, and consider the internal correlations, which allows to examine the relationships between individual and social environment in the same analysis (Heck, Thomas & Tabata, 2012, 5-6).

One of the starting points in multilevel analysis is the naturally hierarchical structure of phenomenon under analysis. Multilevel analysis fits well with multilevel data, which is good to take into account already when collecting data. Naturally hierarchical data means that there is an organization in reality that is not formed for research purposes only. Research data of school is usually naturally hierarchical, so it fits well with multilevel analysis. School data usually has three levels: the lowest level is individual level, in the middle there is classroom level, and the highest level is school level (Välijärvi & Malin, 2005.) In hierarchical data, it is assumed, that observations in the same group somewhat remind each other, such as pupils in the same class. All in all, due to hierarchical nature of the data and factors interacting from various levels simultaneously, using multilevel models for school data is justifiable (Malin & Linnakylä, 2001). In my case, using multilevel models is justifiable for aforementioned reasons: the data that I am using in this study is not perfectly hierarchical, but pupils are nested in their schools, which supports the demand for hierarchical data. Also, group level variables provide deeper insight on my research problem, thus multilevel models are useful for my research design.

One of the challenges is to fit theoretical assumptions into a statistical model. It is quite simple to build multilevel analysis models, but interpretation of the results causes also often difficulties- they might be too narrow or shallow. Model should be constructed in a way that it can be easily interpreted. In the end, the challenges in interpretation of the results are then reflected in the applicability of research results (Ellonen, 2006).

The research data needs to have enough observations (Ellonen, 2006). There needs to be especially enough subpopulation or subsets in upper levels, such as schools. However, in lower levels of data (e.g. pupils), large amount of observations is not that necessary. In practice, this means that if there are enough schools in the data, it does not matter if there are significantly less pupils in some schools than in others, in multilevel analysis. However, if there are a lot of schools with small amount of pupils, the risk for errors will grow (Ellonen, 2006.) Multicollinearity is also an issue to be considered in multilevel analysis. Multicollinearity refers to a situation where variables correlate very strongly with each other. This is a typical problem in social sciences (Ellonen, 2006).

In regression and multilevel models, the fit of the model should be assessed. There are multiple tests that measure coefficients of the models with different criteria, such as intra class correlation (ICC) and Pseudo r2. Besides examining the significance (p-value) of variables, I chose to use AIC, BIC and -2LL to help evaluating the goodness-of fit of the models. I will go more into detail with these tests when introducing the results. To conclude, conducting multilevel analysis is a reasonable method when the data has two or more levels.

3.2.5 Treatment of missing data

Collected data, for example a survey, is often partially incomplete. There might be some missing data in some observations, even if collection of data would be designed carefully. It might be so that response from everyone in a survey is not received, due to different reasons (total nonresponse). The case of item nonresponse is when the respondent is taking part of the research but all of the questions are not responded (for different reasons, e.g. if the respondent does not want to provide answers for specific questions) (KvantiMOTV- Puuttuvat havainnot). The concepts used in classifying of missing data are Missing completely at random (MCAR), Missing at random (MAR) and Missing not at random (MNAR). (Laaksonen, 2010).

As a consequence of missingness in data, the results of analysis might become distorted or biased. If it is not possible by recollecting data to supplement the data, one commonly used basic option is to use weights. Weights are often used in data that does not cover the whole of target population, but results are being presented at the level of target population (Laaksonen, 2010). Calculating suitable weight is somewhat problematic, yet common and a simple way to handle missing data (KvantiMOTV- Puuttuvat havainnot).

In addition with weights, imputation methods are one way of handling missingness in data. The most common reason for imputation is item nonresponse (Laaksonen, 2010) where information lacks in specific variable. The purpose of imputation methods is to substitute missing or incorrect values with substitute values that are as correct as possible- without substitute values, statistical results from the data might be distorted. However, imputation methods are artificial and it should be thought carefully what is estimated- is imputation useful in the level of estimate, does it decrease the bias of estimate or can it enhance the accuracy of estimate (Laaksonen, 2010).

In my case, my data can be characterised as MNAR (missing not at random). I considered whether doing imputation. I did not have the information of sampling nor about response rate, so I was not able to analyse missingness to compute appropriate weights. This analysis is supposed to be preliminary analysis where weights are not used to improve the generalization of the results. In further analysis, analysis of missingness in the data should be made and to consider the imputation of item nonresponse. That would enable to thoroughly explore the large missingness in the data.

In this study, I considered the treatment for missing values carefully: do missing values indicate that the respondent did not answer because he/she was not interested in answering to this question or to this survey as a whole; or that the respondent could not answer for some reason even if he/she would have the interest? The number of missing answers in the data was quite large, so a strict limit in missing answers could not be made in order to have sufficient amount of respondents. The same problems have been found in other research measuring educational outcomes as well, where amount of missing answers is large, and they grow from 7th to 9th grade (Metsämuuronen, 2006). This can possibly be explained by change in attitudes. All in all, I chose to treat missing variables as incorrect answers, as has been done in e.g. Metsämuuronen's (2006) research.

3.3 Trustworthiness of the study

The results of the study should be read considering following limitations. Trustworthiness of a study is traditionally measured by evaluating the reliability and validity of the research. Reliability refers to repeatability of the research- if the same phenomenon would be measured multiple times with the same measurements, would the results be similar or different? If the measurement method is reliable, the answers in different times of measurement would be quite similar. Reliability can be tested in various ways, e.g. by test-retest reliability and split-half measurement (Metsämuuronen, 2011).

Validity indicates if the study is measuring what it is meant to be measured. Validity is divided into external and internal validity (content validity, construct validity, criterion validity)- e.g. in content validity it is examined whether the concepts used in the research are operationalized in a reasonable way. (Metsämuuronen, 2011). It is recommendable to consider possible threats to validity already in the early stage of research.

Next, I will assess the different factors affecting the trustworthiness of this research data. The survey used to collect MetrOP data has some weaknesses- how conscientiously pupils are willing to answer the questions or tasks in the survey? Pupils might have done the survey more carefully, if they knew that the survey would have an effect to their grades (high stakes testing)? (Hautamäki, Kupiainen, Marjanen, Vainikainen & Hotulainen, 2013). Instead, the survey was low stakes testing where pupils might not feel that they need to do their best. This might have an effect to the test results: were wrong or missing answers due to the fact that the questions were too hard, or did they think that this test was not that important? (Hautamäki et al., 2013). Issues with interpreting how missing values should be interpreted and used when conducting analysis were discussed earlier in earlier subchapter.

There are also some practical issues relating to answering the survey. When considering the context of filling out the form, it is good to consider that who answered to this survey? It was held in class, but who was absent from the class when the survey was filled out? The survey was quite long, did all of the respondents have enough time to respond? Students with learning disabilities might have had some problems with finalizing and understanding this survey, especially if they did not have enough time.

Another thing to consider is that was the survey too difficult- did pupils understand what was asked? There might be some issues with trustworthiness of the answers if they respondents did not understand the questions correctly or they were too difficult, e.g. when asked about their parents' education or profession or other background questions. Background questions proved to be difficult, e.g. when compared their answers to their parents' education level and profession, they did not match.

In this data, there was also an option in the data to use the GPA of different subjects provided by the respondents, instead of calculating the change in educational outcomes from mother tongue tasks. However, using GPA would have not been a reliable way to measure change in educational outcomes, since the answers respondents have given by themselves might not be truthful, compared e.g. to these tasks in the survey which can be evaluated in a similar way for all. More importantly, GPAs might not be fully comparable between different schools since practices of grading of every school might differ (Kauppinen, 2004). Moreover, the GPA pupil has reported in the first round of survey is when the pupil is on his/her 7th grade, and the latest GPA is from 6th grade, which does not integrate to the research design in this study.

When measuring change, there are factors to be developed. More than two measurements would improve measuring change (e.g. Bryk & Raudenbush, 1987) Accordingly, Malin & Linnakylä (2001) suggest that to identify developmental trends and conduct satisfactory research on school performance trends over time, at least three measurements should be conducted. Using only two measurements, it is only possible to look at the difference in those two occasions, not to identify any trends. However, getting proper longitudinal data is expensive and laborious (Metsämuuronen, 2006)

One thing to consider is how current the data is. The data in my use is from 2011 and 2014. Even if the data is not brand new, it is still unique and has still exceptionally representative sample, which makes it a great data to utilize on various research purposes.

This research uses hierarchical data which brings along challenges. Hierarchically structured data has multiple levels from smaller units to bigger units, e.g. school classes being at school and schools being at bigger areas such as in municipalities (Laaksonen, 2010). One factor of hierarchical data in this case is that pupils studying in the same class are somewhat more similar between each other than other pupils at the school; and pupils at the same school are often more similar themselves than pupils

in other schools. This is explained by that pupils with similar background end up in similar neighbourhoods and schools (Kuusela 2010, 80-81).

Hierarchical data in school research can cause challenges when analysing data and making conclusions, especially when making conclusions from upper hierarchy level to individual level: statistical connections often become more powerful, when the target of the analysis is school and not pupils. School research is a very complicated phenomena to examine, and statistical methods require to take into account the hierarchical structure of the data (Kuusela 2010, 80-81).

3.4 Research ethics

Research ethics is an essential part of conducting research. In social sciences, responsible conduct of research includes respect for the right of self-determination of the subjects, protection of the privacy of the subjects and avoidance of any harm (Kuula, 2006, 34-39). The Finnish Advisory Board on Research Integrity (TENK) has developed the Responsible conduct of research (Hyvä tieteellinen käytäntö), which suggests for example that research should be done in a careful and transparent way, data acquisition should be ethically sustainable, and preliminary ethical preview should be done when needed (TENK, 2012). Responsible conduct of research should always be taken into consideration when conducting research.

There was a research group that was responsible for collecting the data in this study and to have ethical scientific practices. When conducting research where children are involved, preliminary ethical preview should be done (TENK, 2012). For pupils to participate the survey at school, parents had to fill out a form to agree on participating this research. Thus, parents had to agree whether their children could take part in this research, which is based on good research ethics practices when studying children, who are especially vulnerable. However, based on Child Welfare Act, when a child has turned 12, their opinion on participating the research should also be taken into consideration. In the case of MetrOP data where children in upper comprehensive school age are being studied, it would be a good practice to ask permission from both child and parents (Kuula, 2006, 147-153).

I have been given a permission to use the data for my thesis purposes by researchers in MetrOP research team.

I am carefully considering anonymization of the data. In this study, data and results are presented without any identification data and in an anonymised form, so that no one can be recognized directly or indirectly. I am not using any data with sensitive information of respondents, such as respondents' health data. The data has been treated confidentially, and no one else has granted a permission to the data. I will remove the data from my storage when the research has ended.

3.5 Analytical strategy

In this subchapter, I will introduce the building of the multilevel linear regression models. The variables in the models were chosen based on literature review for this research design. The dependent variable is a dichotomous change in educational outcomes which calculation was introduced in earlier subchapter. Independent variables contain individual level background variables (gender, mother's education, language spoken in family, change of school) and other individual level variables examining with whom spending free time and pedagogical ethos of parents and peers. Since the method is multilevel regression, the model also includes group level variables that describe the area of school or neighbourhood, such as the share of adults having only basic education living in the area, mean income of adults in the area, share of pupils with foreign language at the school, and the Great district of Helsinki number.

The variables were modified in order to fit the regression models. Some variables were recoded into dummy variables, and the continuous group level variables were recoded into different classes. As discussed earlier, new variables (summamuuttujat) were treated as a continuous variable.

I built models in several stages by adding blocks of variables. This is described as a bottom-up strategy, which is recommendable in multilevel models where there is a simple model at first which will be then added complexities (Hox, 2010, 56-59). One of the advantages of adding variables step by step is that it allows to examine the estimates and parameters in each stage (Hox, 2010, 56-59).

I grouped the variables to be used in different blocks based on their thematic content. Since there are over ten variables, adding every variable one by one would not be very effective. First block contained individual level background information, such as gender, mother's education, language spoken with family, and change of school during upper comprehensive school. Second block included the pedagogical ethos of peers and parents, and third block the friends with whom one is spending time

with. After that, I added the first group level variable (adults with only basic education living in the area), and then a final block with the rest of the group level variables (Mean income of adults in the area, Share of pupils with foreign language at the school, Great district number).

First, I created a null model after which I added variables in aforementioned blocks so that the number of variables in each model grew step by step. Each round, I examined how the variance between schools was changing depending on the variables added, thus how different variables help explain between-school variance. This is one of the ways for building models when studying schools with multilevel methods (Ellonen, 2006).

4 Results

4.1 Descriptive findings

A descriptive analysis was made of the variables used in the multilevel analysis as a base for the multilevel models. The central statistics are summarized in Tables 1-13.

Change in educational outcome	N	%
Highest 80%	1148	81
Lowest 20%	263	19
Total	1411	100

Table 1. Change in educational outcome

Gender	N	%
Girl	696	49
Boy	715	51
Total	1411	100

Table 2. Gender

Mother's education	N	%
Basic education or lower secondary education	244	18
Matriculation examination or upper secondary education	425	30
Bachelor's degree	322	23
Master's degree	354	26
Missing	66	5
Total	1411	100

Table 3. Mother's education

Change of school	N	%
Yes	90	6
No	1041	74
Missing	280	20
Total	1411	100

Table 4. Change of school

Language spoken with family	N	%
Finnish	1124	80
Swedish	2	0
Estonian	12	1
Russian	28	2
Other	61	4
Missing	184	13
Total	1411	100

Table 5. Language spoken with family at home

Spending free time with friends from own area	N	%
Never	333	24
Seldom	188	13
Occasionally	294	21
Quite often	273	20
Nearly on a daily basis	217	15
Missing	106	7
Total	1411	100

Table 6. Spending free time with friends from own area

Spending free time with school friends	N	%
Never	77	5
Seldom	149	11
Occasionally	397	28
Quite often	391	28
Nearly on a daily basis	304	21
Missing	93	7
Total	1411	100

Table 7. Spending free time with school friends

Spending free time with hobby friends	N	%
Never	379	27
Seldom	175	12
Occasionally	302	22
Quite often	257	18
Nearly on a daily basis	193	14
Missing	105	7
Total	1411	100

Table 8. Spending free time with hobby friends

Share of adults having only basic education living in the area (%)	N	%
0-19,6	329	23
19,7-25.8	268	19
25.9-30.9	262	18
31-33.7	333	24
33.7-50.7	194	14
Missing	25	2
Total	1411	100

Table 9. The share of adults having only basic education living in the area (%)

Mean income of adults in the area (euros per person)	N	%
0-25 039	250	18
25 040- 27 236	286	20
27 237-30 921	268	19
30 922- 33 750	261	18
33 751-60 787	321	23
Missing	25	2
Total	1411	100

Table 10. Mean income of adults in the area (euros per person)

Share of pupils with foreign language at the school (%)	N	%
0-5,6	483	34
5,7-7	174	13
7,1-14,3	215	15
14,4-23	280	20
23,1-45,7	128	9
Missing	131	9
Total	1411	100

Table 11. The share of pupils with foreign language at the school (%)

Great district of Helsinki	N	%
1 (Southern)	146	10
2 (Western)	298	21
3 (Middle)	67	4
4 (Northern)	194	14
5 (Northeastern)	314	22
6 (Southeastern)	131	10
7 (Eastern)	261	19
Total	1411	100

Table 12. Great district of Helsinki

	Mean	SD	Min	Max	Valid N
Parents' pedagogical ethos	30,4	4,6	5	35	1411
Peers' pedagogical ethos	14,9	3,4	3	21	1410

Table 13. Pedagogical ethos of parents and peers

I will shortly introduce the data. When looking at individual level variables, we can see that genders are quite evenly spread. Higher education (Bachelor's or Master's degree) is the most common mothers' educational level. Matriculation examination or basic education is also a common educational level.

Changing school(s) during upper comprehensive school is not very common among pupils. Finnish is the most common language spoken within families at home. The second common language is "other" which contains various languages which the respondent could specify.

When looking at with whom youth is spending free time with, it seems that they spend their free time quite regularly with their school friends. There are only 16% of those who never or seldom spend time with school friends. In contrast, spending free time with the friends of their own area is more rare-over third never spend free time with them or do only rarely. Spending free time with hobby friends is scattered among pupils: around 40% never or rarely spend time with hobby friends, and over 30% spend time with hobby friends at least quite often.

Some of the group level variables were recategorized into new categories based on their distributions, so that the observations would be distributed more evenly into different categories. For example, in the variable "The share of adults having only basic education living in the area", the category with the highest share of basic education has clearly a bigger range and the least observations.

In the variable "Mean income of adults in the area", the category with the highest mean incomes has a clearly wider range of mean income than the other categories. Therefore, it should be noted that there can be a wide range of different areas in the last category.

Looking at the share of pupils with foreign language at a school, we can see that the categories are not as evenly distributed as in the previous variables. The ranges of the categories in this variable as

well grow wider in the final categories. The category with the highest share of pupils with foreign language at a school has a wide scope, but only a tenth of the pupils in this study are attending that kind of school. In contrast, almost half of the pupils are placed in the two last categories with the least share of pupils with foreign language.

Among Great districts, Eastern (7), Western (2) and Northeastern (5) have the biggest shares of respondents with almost 20% each, whereas Middle district (3) is clearly smallest with having under 5% of the respondents.

When looking at the pedagogical ethos, the mean of parents' pedagogical ethos is quite high, thus indicating that many of the respondents sense that their parents have a positive and supportive attitude towards their education. However, there are some standard deviation in the answers. Peers' pedagogical ethos is also strongly towards positive, and there is some standard deviation as well.

Bivariates are shown in Tables 14-24. Group 1 refers to the 20% of the pupils of the data who had the most negative change in educational outcomes, and the rest of 80% of the pupils are in group 0.

	Great district			
	0	1	Total	N
1 (Southern)	87%	13%	100%	146
2 (Western)	86%	14%	100%	298
3 (Middle)	79%	21%	100%	67
4 (Northern)	72%	28%	100%	194
5 (Northeastern)	82%	18%	100%	314
6 (Southeastern)	76%	24%	100%	131
7 (Eastern)	82%	18%	100%	261
Total	81%	19%	100%	1411

Table 14. Great district of Helsinki

	Gender		
	Girl	Boy	Total
0	87%	76%	81 %
1	13%	24%	19 %
Total	100%	100%	100 %
N	696	715	1411

Table 15. Gender

	Mother's education					
	Basic education or lower secondary education	Matriculation examination or upper secondary education	Bachelor's degree	Master's degree	Missing	Total
0	77%	82%	84%	83%	73 %	81 %
1	23%	18%	16%	17%	27 %	19 %
Total	100%	100%	100%	100%	100 %	100 %
N	244	425	322	354	66 %	1411

Table 16. Mother's education

	Language spoken with family						
	Finnish	Swedish	Estonian	Russian	Other	Missing	Total
0	82%	100%	83%	82%	79%	78%	81%
1	18%	0%	17%	18%	21%	22%	19%
Total	100%	100%	100%	100%	100%	100%	100%
N	1124	2	12	28	61	184	1411

Table 17. Language spoken with family at home

	Change of school			
	Yes	No	Missing	Total
0	72%	83%	79%	81%
1	28%	17%	21%	19%
Total	100%	100%	100%	100%
N	280	90	1041	1411

Table 18. Change of school

Spending free time with friends of own area							
	Never	Seldom	Occasionally	Quite often	Nearly on a daily basis	Missing	Total
0	85%	85%	79%	84%	76%	75%	81%
1	15%	15%	21%	16%	24%	25%	19%
Total	100%	100%	100%	100%	100%	100%	100%
N	333	188	294	273	217	106	1411

Table 19. Spending free time with friends of own area

Spending free time with school friends							
	Never	Seldom	Occasionally	Quite often	Nearly on a daily basis	Missing	Total
0	71%	79%	82%	86%	80%	80%	81%
1	29%	21%	18%	14%	20%	20%	19%
Total	100%	100%	100%	100%	100%	100%	100 %
N	93	77	149	397	391	304	1411

Table 20. Spending free time with school friends

Spending free time with hobby friends							
	Never	Seldom	Occasionally	Quite often	Nearly on a daily basis	Missing	Total
0	84%	80%	78%	84%	80%	78%	81%
1	16%	20%	22%	16%	20%	22%	19%
Total	100%	100%	100%	100%	100%	100%	100%
N	105	379	175	302	257	193	1411

Table 21. Spending free time with hobby friends

Mean income of adults in the area (euros)							
	0-25 039	25 040- 27 236	27 237-30 921	30 922- 33 750	33 751-60 787	Missing	Total
0	80%	80%	83%	84%	79%	92%	81%
1	20%	20%	17%	16%	21%	8%	19%
Total	100%	100%	100%	100%	100%	100%	100%
N	250	286	268	261	321	25	1411

Table 22. Mean income of adults in the area (euros)

Share of pupils with foreign language at school (%)							
	0-5,6	5,7-7	7,1-14,3	14,4-23	23,1-45,7	Missing	Total
0	81%	84%	79%	80%	80%	88%	81%
1	19%	16%	21%	20%	20%	12%	19%
Total	100%	100%	100%	100%	100%	100%	100%
N	483	174	215	280	128	131	1411

Table 23. The share of pupils with foreign language at school (%)

Share of adults with basic education in the area (%)							
	0-19.6	19.7-25.8	25.9-30.9	31-33.7	33.7-50.7	Missing	Total
0	88%	74%	79%	85%	76%	92%	81%
1	12%	26%	21%	15%	24%	8%	19%
Total	100%	100%	100%	100%	100%	100%	100%
N	329	268	262	333	194	25	1411

Table 24. Share of adults with basic education in the area (%)

Negative changes in educational outcomes is more common among boys: only around 13% of the girl respondents are in the group of negative educational outcomes, but almost fourth of the boys belong to that group. Mother's lower or upper secondary education is more common among pupils in decreased educational outcomes than higher education. Among languages spoken with family at home, "other" language has the biggest share of pupils with negative changes in educational outcomes- over fifth who speak other language than Finnish, Swedish, Russian or Estonian, are in the group of negative educational outcomes. The rest of the languages (Finnish, Swedish, Russian, Estonian) are quite equally spread throughout pupils in the group of negative educational outcomes, expect Swedish that has only two speakers in the whole data. Among those who have changed school during upper comprehensive school, almost a third have negative change in educational outcomes. In contrast, among those who have not changed school, there are only under a fifth who have negative change in educational outcomes.

It seems that for pupils with negative change in educational outcomes, it is more common to spend time with friends of own area regularly than rarely. Among those who spend time with friends of their own area nearly daily, a fourth are pupils with negative educational outcomes. In contrast to friends of their own area, it seems that spending time with school friends is not as common for pupils with

negative change in their educational outcomes. Spending free time with hobby friends varies among pupils with negative changes in educational outcomes.

As shown in the univariates, the variables of The share of adults having only basic education in the area, Mean income of adults in the area, and Share of pupils with foreign language at school, were recategorised based on distribution. This is seen in the crosstabs where the classes are quite evenly distributed.

There is clear variation in the pupils with decreased educational outcomes between Great districts. The Northern (4) and the Southeastern (6) districts have the biggest shares of pupils who have negative change in educational outcomes; in the Northern district, almost a third of the pupils have decreased educational outcomes. In contrast, the Southern and the Western districts have the smallest shares of pupils of negative changes in educational outcomes (around 14% of district's pupils)

The analytical strategy of how these models were built is presented in the end of chapter 3. In short, I built models in several stages by adding blocks of variables that were grouped based on their thematic content. First, I created a null model after which I added variables in blocks, first individual level variables, and after that group level variables. Each round, I examined how the variance between schools change depending on the variables added, thus how different variables help explain between-school variance. Next, results of the different models will be introduced.

4.2 The null model

First, I started with composing the null model. The null model has only the outcome variable. The model shows how much the outcome variance is spread between individual and group level.

The estimate of intercept (in Estimates of fixed effects table) in this null model is 0.18, which describes the average changes in educational outcomes of all the pupils in the data. Thus, the average change in educational outcomes is positive, but quite modest.

Individual level variance is described with the residual parameter, which in this model is 0.148 (Table 25). The school level variance in this model is 0.003, which refers to the starting point of school level

variance. From the null model we can see that the school level variance is very small in this phase already, thus no large differences between schools are observed.

Besides examining the significance (p-value) of variables in the forthcoming models, AIC, ICC and -2 loglikelihood are computed to help evaluate the goodness-of fit of the models. AIC (Akaike's information criterion) in this model is 1343 and BIC (Schwarz's Bayesian criterion) is 1354. -2 Restricted log likelihood (-2LL) value is 1339. I will start to examine how these values will change as I add more variables to models.

4.3 The first individual level model with background variables

After the null model, individual level variables were added to explore how changes in educational outcomes can be further explained by adjusting individual level variables. The first individual level model has the following individual level variables: gender, mother's education, the language spoken with family at home and possible change of school during 7th-9th grade.

In this model (Table 25), gender ($p < 0.001$) and changing school ($p < 0.05$) are the most clearly connected variables to negative changes in educational outcomes, compared to other variables. The connection of mother's education and language spoken in the family to changes in educational outcomes is uncertain or explained by other variables in this model. Values that are significant in this table (Values in Type III tests) refer to the significance of the whole variable, compared to table of Estimates of fixed effects (introduced next), where each category of a variable will be counted a significance compared to that variable's reference category.

As mentioned above, values in estimates of fixed effects table show that gender ($p < 0.001$) and changing school ($p < 0.05$) are statistically significantly connected to negative change in educational outcomes. The model shows that girls have 0.11 times smaller risk for a negative change in educational outcomes than boys. Change of school is 0.11 times more probable for a negative change in educational outcomes than not having changed school during upper comprehensive school. Thus, being a boy and changing school are related to negative change in educational outcomes, which is expected based on the literature. Mother's education and language spoken in the family do not have predictive power and their coefficients are not notable. However, the coefficient in Mother's education in category "Basic education or lower secondary education" is quite large (0.49), which

can indicate that negative change in educational outcomes is more likely with pupils whose mothers have basic education than Master's degree.

When we compare the between-schools variance between this model and the null model, we find that they are very similar compared to the previous model: between school level variance component decreases very slightly from 0.0027 to 0.0025. Because school level variance decreased, it means that adjusting these background variables do not increase in between- schools variance.

AIC has grown slightly from 1343 in null model to 1345 in this model. Correspondingly, BIC has also grown slightly from 1354 to 1360 and -2LL from 1339 to 1345. This might indicate that the variables in the model do not have a very strong predictive power when the number of estimated coefficients is taken into account.

4.4 The second individual level model with pedagogical ethos

More individual level variables were added to the following model: parents' and peers' pedagogical ethos (Table 25).

Values in Type III fixed effects table show that gender ($p < 0.001$) and change of school ($p < 0.1$) remain statistically significantly connected to negative change in educational outcomes. Also, one of the new variables, parents' pedagogical ethos, is found statistically significantly connected to negative change in educational outcomes ($p < 0.001$).

Values in Estimates of fixed effects table show similarly that being a boy ($p < 0.001$) and change of school during upper comprehensive school time ($p < 0.05$) remain statistically significantly connected to decrease in educational outcomes, and there are no clear differences in their coefficients compared to previous models. Mother's basic education or lower secondary degree had remarkable coefficient in the previous model (0.49), but in this model the coefficient (0.03) has notably decreased. Therefore, after controlling of the new variables, this connection disappeared.

Also, one of the new variables, parents' pedagogical ethos, has predictive power ($p < 0.001$). This indicates that pupils with the most negative change in educational outcomes have parents with a weaker pedagogical ethos than others. Peers' pedagogical ethos is not found statistically significant. It is interesting to notice the difference between context of pedagogical ethos: parents' pedagogical

ethos has a strong connection whereas peers' pedagogical ethos does not have a connection to change in educational outcomes. Also, looking at the effect of parents on decreased educational outcomes, it is interesting that parents' pedagogical ethos has predictive power but mother's education does not. However, it should be noted that the coefficient of parents' pedagogical ethos is -0.009, showing that the risk for a negative educational outcomes is not very large.

The estimates of the variance components in Estimates of Covariate parameters table suggest that adding new individual level predictors does not have a large effect on coefficients: residual (individual level variance) is 0.14 and between-school variance is 0.0024, which are close to the previous model. Therefore, it seems that there are no large differences in changes in educational outcomes found between schools, at least when controlling only individual level variables.

AIC has grown similarly than with previous models, from 1345 in the previous model to 1347 in this model. However, BIC and -2LL have slightly decreased. Value of BIC was 1360 in the previous model and in this model it has decreased to 1357, and -2LL has decreased from 1345 to 1343. It may indicate that this model has better predictive power than the previous model because new variables have been added but BIC and -2LL value are diminished.

4.5 The third individual level model with free time friends

The last model with only individual level variables was complemented with the variables of with whom respondent is spending free time with: hobby friends, school friends, or friends from own area (Table 25).

The same variables that were significant in previous models, stay significant in this model as well. The new variables as a whole are not found to be statistically significantly connected to negative changes in educational outcomes. The coefficients of variables of categories that do not have predictive power remain unnoticeable. The change of school and being a boy remain connected to negative changes in educational outcomes in this model as well as parents' pedagogical ethos.

However, one category in the variable of spending free time with friends of own area does have predictive power. The model suggests that pupils with negative change in educational outcomes have a 0.09 times lesser probability to "never" spend free time with friends of own area than on a daily

basis- in other words, it refers that pupils with negative changes in educational outcomes spend more time with friends from own area than pupils with better changes in educational outcomes. This result is expected based on earlier literature. Other types of friends of free time is not found connected to changes in educational outcomes.

The estimates of the variance components suggest that adding new individual level predictors do not have a large effect: residual (individual level variance) is 0.14 and between-school variance is 0.0024. Residual is slightly smaller in this model, and between- school variance is about the same. Decreased residual can indicate that the model's predictive power grows when new variables were added.

To conclude, when adding more individual level variables to the model in several blocks, between-school variance stays the same, as well as with residual. There are no large differences found between schools at this point, which indicates that change in educational outcomes is explained by individual factors. Individual level variables such as gender, change of school, parents' pedagogical ethos and spending time with friends of own area have predictive power in change in educational outcomes.

In the previous model, BIC and -2LL slightly diminished, but in this model, they have clearly increased, BIC from 1357 to 1406 and -2LL from 1343 to 1391. Also, AIC has clearly increased from 1347 in the previous model to 1395 in this model. These growths are the largest so far. This might indicate that adding three new variables of free time do not add any predictive power to this model, however, there was statistical significance found in some of the variables and categories in this model.

4.6 The first group level model with the share of adults having only basic education living in the area

Next, first of the group level variables, "Share of adults having only basic education living in the area", will be added. I am exploring how big the variance between schools is and how much it explains the total variance of change in educational outcomes (Table 25).

After adding a new variable, we can see that the same variables as before stay significant, also the new variable that was added is significant (p. <0.005). The loadings of the significant categories in previous models stay quite similar in this model as well. The coefficients of variables of categories that do not have predictive power remain unremarkable.

When adding the first school-level predictor and controlling the other predictors, we can see that the share of adults having only basic education living in the area is affecting changes in educational outcomes in two ways: having lowered grades is negatively connected to living in an area with the least share of adults with basic education- pupils with negative changes in educational outcomes have 0.09 lower probability to attend a school that has the least share of adults with basic education than living in an area with the highest share of adults with only basic education. Furthermore, pupils with negative changes in educational outcomes have 0.08 lower probability to attend a school that has the second most share of people with basic education than living in an area with the highest share of adults with only basic education. However, the results are twofold, so it is difficult to draw any clear conclusions on which kind of area is the most strongly connected to negative change in educational outcomes. Nevertheless, the results suggest that the neighborhood of the school has a connection to educational outcomes, which is an interesting result from the perspective of school neighbourhood effects.

Adding the first group level variable to model 4 makes no clear changes to the residual. However, between-school variance decreases from 0.002 to 0.0004. It is the largest decrease in between schools variance so far. It indicates that adding this variable explains between school variance most successfully so far.

In this first group level model, AIC, BIC and -2 LL have continued to increase. However, the increase is not as great as between the two latest models of individual variables only. AIC grows from 1395 to 1403, BIC grows from 1406 to 1413, and -2LL from 1391 to 1399.

In conclusion, it seems that adding a group level variable indicates more powerfully than in the previous models that there is no variance between schools, and based on residual, AIC and BIC, adding this variable is not necessary. However, the new variable that was added was statistically significant ($p= 0.004$) and it explains the between school variance most successfully so far.

4.7 Final model

Next, I added additional group level variables one by one (not shown in tables). Adding group level variables one by one does not really change between-school variance or residual parameters compared to this final model. Referring to the previous model with only one group level variable, I tested having different group level variables in the first group level model, but the result is the same in the final model- the order of these variables do not affect the final model. I noticed that whichever variable I added as a second group level variable, the between school variance would drop to 0. Thus, when there are two or more group level variables, between school variance would decrease to 0.

In the final model, more group level variables were added: “Mean income of adults in the area of school”, “Share of pupils with foreign language at the school”, and “Great district of Helsinki” .

The final model is shown in table 25. In the final model, after adding all the variables, we can see that some of the new variables have predictive power: Mean income of adults in the area ($p < 0.05$) and share of pupils with foreign language at the school ($p < 0.05$). Great district does not have predictive power as a variable. Interestingly, the significance in the variable of share of adults having only basic education living in the area drops from $p=0.004$ to $p=0.044$.

Model number	0				**I**				**II**				**III**				**V**				**VI**		
Description	Null model				The first individual level model with background variables				The second individual level model with pedagogical ethos				The third individual level model with freetime friends				The first group level model with the share of adults having only basic education living in the area				Final model		
	B	sig	F test sig		B	sig	F test sig		B	sig	F test sig		B	sig	F test sig		B	sig	F test sig		B	sig	F test sig
Intercept	0.142549		0.000		0.225470		0.000		0.537980		0.000		0.572796		0.000		0.60		0.000		0.369046		0.00
Gender							0.000				0.000				0.000				0.000				0.00
Girl					-0.11	0.000			-0.11	0.000			-0.01	0.000			-0,10	0.000			-0.09	0.000	
Boy																							
Mother's education							0.24				0.46				0.44				0.54				0.68
Missing					0.77	0.17			0.07	0.23			0.07	0.22			0.06	0.29			0.04	0.52	
Basic education or lower secondary education					0.48	0.14			0.03	0.32			0.04	0.26			0.03	0.41			0.03	0.41	
Matriculation examination or upper secondary education					0.002	0.94			-0.004	0.88			0.004	0.88			-0.001	0.97			0.0004	0.99	
Bachelor's degree					-0.01	0.64			-0.01	0.65			-0.01	0.63			-0.02	0.52			-0.019	0.53	
Master's degree																							
Language spoken with family							0.87				0.93				0.96				0.97				0.91
Missing					0.34	0.27			0.03	0.41			0.02	0.47			0.02	0.53			0.33	0.30	
Swedish					-0.15	0.57			-0.15	0.58			-0.14	0.61			0.14	0.60			-0.12	0.67	
Estonian					-0.03	0.82			-0.02	0.84			-0.01	0.92			-0.02	0.87			-0.04	0.97	
Russian					-0,03	0.73			-0.03	0.69			-0.02	0.76			-0.02	0.75			-0.02	0.74	
Other					0.01	0.83			0.01	0.76			0.02	0.74			0.009	0.86			0.01	0.82	
Finnish																							
Change of school							0.03				0.09				0.08				0.06				0.06
Missing					0.03	0.28			0.02	0.42			0.02	0.38			0.03	0.27			0.03	0.33	
Yes					0.11	0.01			0.09	0.03			0.09	0.03			0.10	0.03			0.10	0.02	
No																							
Parents' pedagogical ethos									-0.009	0.000	0.000		-0.009	0.000	0.000		-0.009	0.000	0.000		-0.009	0.000	0.000
Peers' pedagogical ethos									-0.0002	0.95	0.95		-0.0009	0.78	0.78		-0.0010	0.77	0.77		-0.001	0.70	0.70
Spending freetime with school friends															0.09				0.08				0.08
Missing													-0.11	0.17			-0.12	0.15			-0.11	0.17	
Never													0.10	0.06			0.10	0.06			0.10	0.05	
Seldom													0.04	0.33			0.04	0.34			0.04	0.34	
Occasionally													-0.004	0.90			-0.006	0.85			-0.002	0.95	
Quite often													-0.03	0.43			-0.03	0.40			-0.03	0.41	
Nearly on a daily basis																							
Spending freetime with friends from own area															0.07				0.06				0.07
Missing													0.08	0.26			0.10	0.18			0.10	0.18	
Never													-0.09	0.02			-0.08	0.03			-0.08	0.03	
Seldom													-0.07	0.08			-0.07	0.10			-0.06	0.11	
Occasionally													-0.03	0.48			-0.02	0.57			-0.02	0.66	
Quite often													-0.05	0.21			-0.04	0.26			-0.04	0.30	
Nearly on a daily basis																							
Spending freetime with hobby friends															0.43				0.37				0.50
Missing													-0.01	0.88			-0.01	0.88			-0.007	0.93	
Never													-0.04	0.21			-0.05	0.13			-0.04	0.22	
Seldom													-0.004	0.92			-0.009	0.82			-0.0009	0.98	
Occasionally													0.02	0.68			0.01	0.78			0.01	0.71	
Quite often													-0.03	0.35			-0.03	0.34			-0.03	0.40	
Nearly on a daily basis																							
Share of adults having only basic education living in the area (%)																			0.004				0.04
Missing																	-0.10	0.24			0.01	0.95	
0-19,6																	-0.09	0.02			-0.08	0.42	
19,7-25.8																	0.04	0.31			0.06	0.52	
25.9-30.9																	-0.02	0.64			-0.04	0.58	
31-33.7																	-0.08	0.04			-0.07	0.36	
33.7-50.7																							
Mean income of adults in the area (euros per person)																							0.05
Missing																							
0-25 039																					0.17	0.10	
25 040- 27 236																					0.13	0.13	
27 237-30 921																					0.11	0.13	
30 922- 33 750																					-0.04	0.53	
33 751-60 787																							
Share of pupils with foreign language at the school (%)																							0.04
Missing																					0.08	0.34	
0-5,6																					0.16	0.01	
5,7-7																					0.01	0.83	
7,1-14,3																					0.14	0.02	
14,4-23																					0.07	0.17	
23,1-45,7																							
Great district of Helsinki																							0.14
1 (Southern)																					0.10	0.16	
2 (Western)																					0.04	0.46	
3 (Middle)																					-0.06	0.38	
4 (Northern)																					0.14	0.02	
5 (Northeastern)																					0.03	0.64	
6 (Southeastern)																					0.15	0.02	
7 (Eastern)																							
Residual	0.148708				0.145262				0.143304				0.1423628				0.142529				0.142021		
Intercept	0.002797	0,51			0.002527	0.64			0.002447	0.069			0.002371	0.071			0.000365	0.675			0.00000		
AIC	1343				1345				1347				1395				1403				1447		
BIC	1354				1360				1357				1406				1413				1457		
-2 LL	1339				1345				1343				1391				1399				1443		

Table 25. Final model

In the final model as well as in the previous models, one of the statistically strongest single predictors of changes in educational outcomes is gender. The final model shows that girls have 0.09 times lesser risk for negative change in educational outcomes than boys. Based on literature in Finnish context, it is an expected result that boys are more prone to negative changes in educational outcomes. (Ristikari et al., 2016; Pekkarinen & Myllyniemi, 2017).

Another variable that had predictive power in many of the models was changing school during upper comprehensive school. In the final model, change of school is 0.10 times more probable for a negative change in educational outcomes than not having changed school during upper comprehensive school.

From the rest of the individual level variables, the language spoken with family at home does not have predictive power. This variable was meant to measure the immigration background of the family, as used in a study with similar data (Vainikainen et al., 2016). When looking at the coefficients of the variable throughout the models, we can see that Swedish speaking families have a larger coefficient than the other languages. The coefficient is negative, so it might indicate that negative change in educational outcomes for pupils speaking Swedish with family is not as likely than for those who speak Finnish with family. Based on the results, it seems that immigration background (unless Swedish) is not connected to changes in educational outcomes.

Mother's education level is not statistically significantly connected to having lowered grades. However, in the first model, the coefficient in mother's education in category Basic education or lower secondary education is quite large (0.48), which can indicate that negative change in educational outcomes is more likely for pupils whose mothers have basic education than Master's degree. In the following models, the coefficients decreased. However, if we look at the direction of the other coefficients, we can observe that the coefficient of Bachelor's degree is negative, thus it can further indicate that low level of mother's education is connected to negative change in educational outcomes.

Parents do have effect in educational outcomes other variables as well: parents' pedagogical ethos is statistically significant ($p < 0.000$): having decreased educational outcomes is connected to lower parents' pedagogical ethos, compared to pupils with better changes in educational outcomes. However, the coefficient of parents' pedagogical ethos is small (-0.009), so the effect might not be

very strong. Also, it should be noted that the pedagogical ethos in this study refers to pupil's impression and evaluation on their parents' attitudes towards education-thus, the impression that parents do not value education is connected to negative change in educational outcomes of their children.

In contrast to parents' pedagogical ethos, it seems that peers' pedagogical ethos is not connected to having lowered grades. It is an interesting result that parents' pedagogical ethos is connected to changes in educational outcomes, but peers' pedagogical ethos does not have a similar power on changes in educational outcomes. Thus, the effect of peer group, which is seen as strong for youth (Pinkster & Fortuijn, 2009), does not lead to negative changes in educational outcomes in this study.

Peer effect was examined additionally with different groups of friends to spend free time with. In the final model, some statistical significance was found from never spending free time with friends of own area ($p < 0.05$) and never spending free time with school friends ($p < 0.05$). The results suggest that pupils with negative change in educational outcomes have a 0.08 times lesser probability to "never" spend free time with friends of own area than spend free time with them on a daily basis- in other words, it indicates that pupils with negative change in educational outcomes spend more time with friends from own area than pupils with better changes in educational outcomes. Also, in the final model, the results show that pupils with negative change in educational outcomes have a 0.10 times larger probability to "never" spend free time with school friends than on a daily basis- thus, they spend more time with friends of own area than with school friends. Concerning hobby friends, there is no statistically significant interaction either way. Interestingly, it seems that spending free time with friends of own area does have an effect on negative changes in educational outcomes, but the pedagogical ethos of friends does not have any predictive power to changes in educational outcomes.

Next, I will move to look at parameters of group level variables in this model. Some of the categories of the variables added have predictive power. Also, coefficients in group level variables were mainly bigger than in individual level variables- thus these variables might have a stronger effect on changes in negative educational outcomes.

The share of pupils with foreign language at the school is statistically significantly connected variable to changes in educational outcomes ($p < 0.05$). The categories that are statistically significant, have also the biggest coefficients. The results are twofold: on one hand, pupils with negative changes in

educational outcomes have a 0.16 larger probability to study at a school with the least share of pupils with foreign language at the school than at a school with the highest share of foreign language pupils. On the other hand, pupils with negative changes in educational outcomes have a 0.14 larger probability to study at school in the middle category (7-14%) than studying at a school with the highest share of foreign language pupils. The results might indicate that having decreased educational outcomes would not be connected to attending a school with the largest share of foreign language pupils.

Mean income of adults in the area of the school is significant as a variable. However, the significance drops when looking at categories in estimates of fixed effects table. It might indicate that statistically significant differences might be located elsewhere, and they are not seen with this reference category. However, the coefficients of the categories are remarkable for the three lowest income classes. The coefficient of the lowest income class is the greatest (0.17), which can indicate that negative change in educational outcomes is more likely at a school located in a low income area than in a high income area. Also, it should be noted that the category with the highest mean incomes has a clearly wider scope of mean income than the other categories, thus it should be noted that there can be a wide range of different areas in the last category. Overall, the results might indicate that negative educational outcomes are more likely in a school that are located in low income areas.

Similarly, the significance in the whole variable of "The share of adults having only basic education living in the area of school" drops from ($p=0.004$ to $p=0.044$). Also, the statistical significance of the categories that were significant in the previous model drop. Thus, after controlling of all the variables, it seems that basic education in the area does not have that significant connection to the outcome variable, so other independent variables have a stronger connection to the outcome variable and they overshadow the connection that was seen in the model 4. Thus, this variable explains changes in educational outcomes well without other group level variables.

Some of the great districts of Helsinki are statistically significant. Schools located in Great districts of 4 (Northern: Maunula, Länsi-Pakila, Tuomarinkylä, Oulunkylä and Itä-Pakila) ($p. <0.05$) and 6 (Southeastern: Herttoniemi, Laajasalo, Kulosaari) ($p.< 0.05$) are connected to having lowered grades. The results suggest that the pupils attending school in the Northern and the Southeastern Helsinki have a bigger risk to have negative educational outcomes than in the Eastern Helsinki. In the Southeastern district, the difference is biggest (coefficient is 0.15), compared to Eastern Helsinki.

Interestingly, this variable as a whole is not significant (in type III tests of fixed effects table). It might be so that some differences are so large that they end up having significant results, but the variable as a whole might have too many categories so that it will not achieve statistical significance.

Estimate of intercept (in Estimated of fixed effects table) in the final model is 0.37 which describes change in educational outcomes of all the pupils in the data, thus the average change in educational outcomes in this model is 0.37. The average changes in educational outcomes in the null model was 0.18. Adding categorized variables cause that this intercept does not describe the average changes in educational outcomes of the whole group, but the mean of the reference group. Residual (individual level variance) stays the same as in the previous model. However, it is interesting that now intercept (school level variance) decreases from 0.0004 to 0.

Because between school variance is 0 in this model, it indicates that there are no differences between schools. The small amount of between school variance in previous models has now diminished to 0 with the addition of more group level variables. It is a clear decrease and it indicates that adding group level variables explain between school variance successfully. To conclude, there are no differences between schools found, but there are connections found between the decline in educational outcomes and certain qualities of the neighborhood of the school, and individual level factors.

4.8 Limitations of the study

In the final model, AIC has greatly grown from 1403 in the previous model to 1447 in the final model. Similarly, BIC has greatly grown from 1413 to 1457 and -2LL from 1399 to 1443. The difference between these estimates in the null model and final model are remarkable, e.g. AIC grows from 1343 to 1447 and BIC from 1354 to 1457. The biggest growth was between Model 2 and Model 3; and between Model 4 and the Final model. As was the case with previous model(s), this might indicate that adding new variables does not add any predictive power to this model, however there was statistical significance found in these variables and categories, and intercept clearly decreased.

Hox (2010) suggests that "The model with the number of parameters that produces the smallest AIC is favored". Based on this suggestion, Model 1 after the null model would be the most suitable to use. However, in Model 2, AIC has grown only slightly and BIC and -2LL have decreased, thus Model 2 would be useful too. From the models that have also group level variables, Model 4 would be a favorable model since its' parameters do not increase as remarkably as going from Model 4 to final model. However, the final results and analyses shown are from the final model, because the final model includes all the chosen variables to explain educational outcomes, based on research questions and literature.

Also, it should be noted that AIC and BIC have a penalty function- the model with a small number of estimated parameters usually get smaller values of AIC and BIC (Hox 2010). Thus, this penalty function makes comparing models more difficult. As with statistical tests usually, these tests have issues, so making strong interpretations based on these is not recommendable- they are indicative.

To complement AIC and BIC, I am also looking at the deviance of -2*log likelihood. It is part of maximum likelihood (ML) estimation methods which often are used for generalized linear models and for multilevel models. Maximum likelihood methods provide ways to determine how well a proposed model fits, with several assumptions, e.g. that there is sufficient sample size. ML statistics are often defined as -2*log likelihood (- 2LL). The deviance of -2LL shows how well the model fits the data. Models with lower deviance fit better than models with higher deviance (Heck et al., 2012, 27).

Hox (2010) suggests that multilevel estimation procedures with categorical outcomes are only approximate. The nature of the quasilikelihood estimation should be considered. The solutions are approximate because variance is rescaled every time new variables are added to a model. Due to approximate solutions, test statistics e.g. in the deviance of -2LL might not be accurate (Heck et al., 2012, 27).

To further evaluate goodness-of-fit of the final model, Q-Q plots were made. Q-Q plots can be used as a graphical tool to help evaluating the observations of the statistical model used- they show if the data is Normally distributed. The points will be on or close to the line if the data is approximately Normally distributed. When looking at residuals in Q-Q plots, they can show patterns in the data and help improving the model being used. In the first graph in Appendix 2, the points seem to fall about a straight line, which indicates that the data should be Normally distributed. In the second graph in Appendix 3, points fall along a straight line in the middle of the graph, but they curve off in the extremities which can indicate that there are some extreme values than would be expected in case of the data having a Normal distribution.

Finally, I made robustness checks and tested whether the results would change when treating the outcome variable more loosely. In the final model, educational outcomes variable was dichotomic so that 20% of the pupils of the data who had the most negative change in educational outcomes belonged to class 1, and the rest of 80% of the pupils belonged to class 0. Now I increased the limits so that class 1 contained 30 % of the pupils who had the most negative change in educational outcomes, and the rest 70% belonged to class 0. Even more broad limits would not have been possible, since the distribution of changes in educational outcomes is so that the next category would be those with their change in 0, thus no negative change- this test includes all the pupils whose educational outcomes have decreased. I ran the final model with the new outcome variable, and it seems that the variables are mainly loading in a similar way than with the original outcome variable- same variables load statistically significantly as in tighter limits. Between school variance is 0.000 with this limit as well, and residual is 0.05 bigger.

All in all, it could have been so that the pupils in the outcome variable used in the final model would have had some special factors effecting to their educational outcomes so I tested with more broad

limits, thus with more pupils, if the results would be the same. It seems that the results are similar, regardless of tightness of limits in the number of missing answers in educational outcomes.

5 Discussion and conclusion

In this thesis, I have examined the mechanisms connected to negative changes in educational outcomes in upper comprehensive schools in Helsinki. The data in this study provides exceptionally unique opportunities to examine the effects of neighbourhood and school differentiation seen already in the pupils of comprehensive school age.

Also, from the point of view of equal educational opportunities, it is important to examine the mechanisms that are connected to school success which can influence the whole of later educational path. Are the factors connected to decline in educational outcomes group or individual level factors? Does neighbourhood or school have an effect, or is it more strongly connected to individual characteristics, such as parents' background or peer effects? If there are any contextual effects, they might be seen already in educational outcomes during comprehensive school.

In this study, I have introduced the concepts of segregation, neighbourhood effect, school differentiation and social context such as peer effect and parental strategies that are connected to this complex topic. My main method in this study was hierarchical linear regression which was suitable for the purpose of the hierarchically structured data.

First, I am going to introduce the results of the multilevel regression models and to consider the results from the perspective of my research questions and previous research. Furthermore, I am evaluating practical implications and the significance of this study as well as give suggestions for future research.

My research questions were,

1. What are the factors associated with negative changes in educational outcomes of individual students during the transition from 7th to 9th grade?
2. Is there an association between decreasing individual educational outcomes and socio-spatial or school segregation? What is the role of individual factors and social context?

Next, I will go through the results. First, I will examine the results of individual level factors explaining the change in educational outcomes. After that, I will look into the group level factors, which provide conclusions for the second research question.

To start from individual level results, when looking at gender, boys have a bigger risk for negative change in educational outcomes than girls, which is expected based on previous research. In Finland, the differences between genders are seen throughout the educational path: grades are differentiated between genders already in basic education. Girls have overall higher grades than boys in comprehensive school (Ristikari et al., 2016; Pekkarinen & Myllyniemi, 2017). The differences in level of school success between genders have been growing from the 2000s (Pekkarinen & Myllyniemi, 2017).

Similarly, in Finland's PISA results, for several years, the differences between boys and girls in literacy and natural science have been one of the biggest in OECD countries, girls succeeding better than boys. (e.g. Ristikari et al., 2016; Rautopuro & Juuti 2018; Leino et al., 2019). Also, girls have traditionally better grades in mother tongue than boys (Ristikari et al., 2016). This research thus reinforces the results from previous research on Finnish pupils.

Gender segregation by educational and occupational fields is an issue since the segregation seen in upper comprehensive school has long term effects on the whole of the educational path and future occupation, all the way to differences in salary between genders and unequal distribution of power in the society (Lahtinen, 2019). Educational outcomes and attitudes towards education during comprehensive school often directs the educational decisions for upper secondary level, which is an important transition phase (Lahtinen, 2019). Often, when applying for upper secondary level education, educational paths of genders start to separate- girls attend high school more often than boys (Sarasjärvi, 2019), and sectors in vocational upper secondary level are very differentiated between genders, which is reflected to higher education as well (Villa 2016). This research focuses on the differences in educational outcomes in upper comprehensive school, but the differences that start from there have an effect throughout educational paths. From the point of view of the egalitarian ethos in schooling and Finnish Basic Education Act, gender segregation is a conflicting result.

Based on the results, changing school during upper comprehensive school is connected to lowered grades. This is also an expected result, since changing school(s) might have different kinds of effects.

In Finnish context, it has been studied that changing school multiple times is connected to a weak GPA in basic education leaving certificate, repeating grade, experiencing the difficulty of making friends, being bullied, and generally enjoying school less (Pekkarinen & Myllyniemi, 2017). Interaction at school with peers might also be more difficult. It is also reflected in the subsequent educational path with an increased risk of being completely deprived of degrees and study places (Pekkarinen & Myllyniemi, 2017).

However, it is good to notice that changing school can also be about choosing a school. "School shopping" is especially practiced by parents with high education in bigger cities in Finland (Seppänen, 2006). Seppänen (2006) interestingly observed that the school success of children of highly educated parents is not connected to changing school. However, changing school is observed mainly with lower educated parents. Research shows that changing school is not the only factor explaining weak school success, it is connected to developmental context of children, such as their family's low socioeconomic background and declined wellbeing. It would be interesting to look more thoroughly at the group of pupils with decreased educational outcomes who have changed their school during upper comprehensive school and the mechanisms that are connected to change of school and decreased educational outcomes, as well as the difference between school shopping and involuntary change of school.

One of the variables measuring individual background factors was language spoken at home. It was meant to measure immigration background in individual level, as used in a previous study with similar data (Vainikainen et. al., 2016). However, it should be noted that this definition used for immigrants is not absolute since the language spoken at home with family can be different than mother tongue, and there is no information on how long the family of the pupil has lived in Finland. The results show that this variable did not have predictive power. However, when looking at the coefficients of the variable throughout the models, we can see that speaking Swedish with family has a larger coefficient than the other languages. The coefficient is negative, so it might indicate that decline in educational outcomes for pupils from Swedish speaking families is not as likely than for those who speak Finnish with family.

Based on the results, it seems that immigration background is not connected to change in educational outcomes. This result is contrary to previous research that has studied that in the Finnish context, there are some differences in school success between immigrants and the original population. For

example, Finland's PISA results from the year 2018 show that the difference between pupils with immigrant background and the original population has been one of the biggest in PISA countries for several years of PISA tests (Leino et al., 2019). Pupils with immigrant background have weaker results than pupils from the original population. However, when looking at literacy, the connection of gender and socioeconomic background is stronger than immigrant background (Leino et al., 2019).

Research of Finnish context shows that weak educational outcomes at school can be explained for example if the language spoken at home and teaching language at school differ (Kirjavainen & Pulkkinen, 2017). Also, one factor explaining weaker educational outcomes is the family background of immigrants, which often is lower education and lower income, compared to the original population. (Kilpi-Jakonen, 2017; Leino et al., 2019).

A compensatory factor in the weaker educational outcomes of pupils with immigration background might be that the attitudes of immigrants towards studying are more positive than for the original population on average, and immigrants enjoy going to school more than the original population. (Räisänen & Kivirauma, 2011; Harju-Luukkainen, Nissinen, Sulkunen, Suni & Vettenranta, 2014). Despite studying can be difficult due to for example language barriers, immigrants often have a higher learning orientation than the original population. It is interesting that boys in the ninth grade with immigrant background value education more than boys with a Finnish background, and simultaneously they have more difficulties in studying than other pupils (Kalalahti et al., 2017.) In this study, there were no connections found between negative change in educational outcomes and immigration background, which is a positive result on the perspective of equality in education. However, the result should be considered with the weaknesses of the operationalization of immigrant background.

Mother's education did not have predictive power in any of the models. However, in the first model, the coefficient in the category of Basic education or lower secondary education is quite large (0.49), which can indicate that negative change in educational outcome is more likely for pupils whose mothers have basic education than Master's degree. In the following models, the coefficients decrease. However, if we look at the direction of the other coefficients, we can see that the coefficient of Bachelor's degree is negative, thus it can further indicate that low level of mother's education is connected to decline in educational outcomes. This is an expected result, since in previous research, family background based on mother's education is found to have a connection with educational

outcomes in upper comprehensive school (e.g. Hautamäki et al., 2013; Vainikainen et al., 2016). Also, the connection between mother's education and their childrens' learning has been found stronger than father's connection towards childrens' learning (Myrskylä, 2009).

PISA 2018 results showed that the socioeconomic background of pupils influences their success in PISA tests (Leino et al., 2019). The connection between socioeconomic background and grades is explained by parents' positive attitudes towards education, and parents' economic and social resources and how they can support their childrens' studying (e.g. Turkheimer, Haley, Waldron, D'Onofrio & Gottesman, 2003; Harju-Luukkainen, Aunola & Vettenranta, 2018). Also, parents' socioeconomic status is often connected to parents' wellbeing, hence that reflects to their childrens' wellbeing as well. However, when looking at the transmit of education, not only the socio-economic status of the family should be taken into account but also the family's ways to operate (toimintamalli) and cultural capital, which can be transformed into positive school attitudes through interaction at home, and which can further influence school success (Kalalahti, 2012).

With survey methods, the cultural capital and practices of the families can be hard to measure. In this study, one of the ways to measure this was to look at pedagogical ethos of parents, from the perspective of the pupils. Thus, the effect of family environment was measured also with parents' pedagogical ethos. The results show that parents' pedagogical ethos is statistically significantly connected to decrease in educational outcomes. However, it should be noted that the coefficient of parents' pedagogical ethos is small (-0.009), so the effect might not be very strong. The new variable (summamuuttuja) was formed by different questions, such as how parents support and value studying, and if the respondent has good relations with his/her parents. Thus, this result can also indicate that the pupils with decreased educational outcomes do not have very good relations with their parents. Similarly, previous research shows that good and supportive relationship with parents is connected to school success and enjoying school (Kalalahti, 2012).

It should be noted that the pedagogical ethos refers to pupils' impression and evaluation on their parents' attitudes towards education-thus, the impression that parents do not value education or support studying can have power that reaches into decreased educational outcomes of their children.

Based on the results, it seems that peers' pedagogical ethos is not strongly connected to having lowered grades. It is an interesting result that parents' pedagogical ethos is somewhat connected to

having lowered grades, but peers' pedagogical ethos does not somehow have as powerful an effect. Peers' pedagogical ethos in this study indicates that friends value and are interested in the things taught in school and see schooling and learning important.

Peer context was additionally examined with whom the pupil is spending free time with. Comparing friends to spend free time with, the results indicate that pupils with decreased educational outcomes spend more time with friends from own area than other pupils. Also, in the final model, the results show that pupils with decreased educational outcomes have a 0.10 times larger probability to "never" spend free time with school friends than on a daily basis- thus they spend more time with friends of own area than with school friends. Concerning hobby friends, there is no strong interaction found either way in the results. However, it should be noted that for some pupils, school friends and friends from own area might be (partly) the same.

The peers with whom free time is being spent are important from the perspective of educational and professional outcomes. Based on previous research, living in a disadvantaged area is often connected to spending more time with peers in the local neighborhood and socialization with them. Peers might transmit harmful attitudes, behaviour or negative attitudes towards education (Knuuti, 1982). An interesting question is that if there are a negative pedagogical ethos in local neighborhood, does having hobbies outside of own neighbourhood protect from negative pedagogigal ethos that transmits from peers of local neighbourhood? This study did not give any results that (lack of) spending time with hobby friends would have any connection to decreased educational outcomes.

Based on peers' pedagogical ethos, this study did not find similar connections as previous Finnish studies where the effect of peer values in upper comprehensive school was found strong, compared to lower comprehensive school. Usually peers have a strong significance as a peer group (vertaisryhmä) especially in upper comprehensive school (Bernelius, 2013, 71). Interestingly, it seems that spending free time with friends of own area does have an effect on negative changes in educational outcomes, but the pedagogical ethos of friends doesn't have any predictive power to changes in educational outcomes.

My purpose was also to examine how group level variables can explain decreased educational outcomes. The results indicate that some factors describing the neighbourhood of the school are connected to decreased educational outcomes.

When looking at the share of pupils with foreign language at the school, the results are twofold: on one hand, having lowered grades is connected to the category of the least share of foreign language pupils, and on the other hand, it is connected to the category in the middle, compared to the category with the highest share of pupils at the school with foreign language. The categories that are statistically significant have also the biggest coefficients. Thus, the results might indicate that studying in a school environment with the largest share of foreign language pupils does not have an effect on declined educational outcomes.

The mean income of adults in the area of the school is significant as a variable. However, the significance drops when looking at categories in the Estimates of fixed effects table. However, the coefficients of the categories are remarkable for the three lowest income classes. The coefficient of the lowest income class is the greatest (0.17), which can indicate that decline in educational outcomes is more likely at a school located in a low income area than in a high income area. Also, it should be noted that the category with the highest mean incomes has a clearly wider scope of mean income than the other categories, thus there can be a wide range of different areas in the last category. All in all, the results might indicate that negative educational outcomes are more likely in schools in low income areas. This is an expected result based on earlier research on neighborhood effects (e.g. Sampson, 2012).

When looking at the share of adults with only basic education in the area of a school, in model 4 there were two types of results: having lowered grades is not connected to living in an area with the least share of adults with basic education, nor living in an area with the second most share of people of basic education. However, after controlling of all variables in the final model, it seems that adults with only basic education in the area do not have a significant connection to the outcome variable, so other independent variables have a stronger connection to the outcome variable and they might overshadow the connection that was seen in the model 4. Thus, this variable has predictive power without other group level variables. All in all, there is a connection with this variable describing the area of school and decline in educational outcomes but the result of the connection is not clear. In previous Finnish research, it has also been found that the educational structure of residents in the area has an effect on completing matriculation examination (Kauppinen, 2004), and that the socioeconomic features of the neighborhoods of school, is connected to school success (Bernelius, 2013).

One of the variables describing an area chosen to the study was the Great district of Helsinki, based on the school's location. Are there some Great districts where pupils with decrease in educational outcomes are especially concentrated, or on the other hand, are there some schools where the pupils with decreased educational outcomes are not concentrated? The results show that schools located in Great districts of 4 (Northern: Maunula, Länsi-Pakila, Tuomarinkylä, Oulunkylä and Itä-Pakila) ($p. <0.05$) and 6 (Southeastern: Herttoniemi, Laajasalo, Kulosaari) ($p. < 0.05$) are connected to pupils with decrease in educational outcomes. The results suggest that the pupils attending school in Northern and Southeastern Helsinki have a bigger risk to have negative educational outcomes than in Eastern Helsinki. In Southeastern district, the difference is biggest, compared to Eastern Helsinki.

These results can be examined based on different statistics describing Great districts. These statistics, such as tertiary level of residents, median income of households, share of rented dwellings and unemployment rate describe the socioeconomic status of families in the area, which then can be reflected to school success. These results are unexpected, because Northern and Southeastern Great districts do not have clearly lower aforementioned rates, compared to the city´s average numbers or compared to Eastern Great district (Helsinki alueittain, 2019). However, it should be noted that there is some variation between areas inside the districts. It would be interesting to examine more closely, what could explain that these districts are connected to pupils with negative change in educational outcomes, since these districts perform better in statistics than Eastern Helsinki. Is there something special in the schools located in Northern or Southeastern districts, for example in their operational environment?

One of the main results is that there was no variance found between schools, and from this perspective, there is no neighbourhood effect found. There is some Finnish research where similar results were found- where schools do not explain differences well and therefore do not support the claim that educational outcomes would be systematically differentiated in Helsinki Metropolitan area (e.g. Hautamäki, Hautamäki & Kupiainen, 2009; Vainikainen et al., 2016). In Pisa 2018 tests, differences between schools were not found either (Leino et al., 2019). However, there is not much research on this topic on Finnish context.

There was no variance found between schools, but some of the qualities describing neighborhoods indicate that some neighbourhood effect might be found: there were indications that pupils with

negative educational outcomes are more likely to study in schools that are located in low income areas than higher income areas. Also, for pupils with negative change in educational outcomes, attending a school that is located in Northern or Southeastern Great districts is more likely than attending a school in Eastern Great district. Therefore, there is some spatial concentration in decreased educational outcomes found in Helsinki.

This is a complex topic- school itself might not affect educational outcomes since there are no differences between schools, but the area around the school or location can have an effect. When looking at the school environment inside the school, the results indicate that having decreased educational outcomes would not be connected being at a school with the largest share of foreign language pupils.

Neighbourhood context can also affect through peer groups- pupils with negative change in educational outcomes are more likely to spend time with friends of own area than with school friends. Thus, residential context and its' peers might affect school performance and peers can transmit or moderate the effects. It would be interesting to study these mechanisms more thoroughly, for example the differences in the effects between peers in disadvantaged and advantaged areas.

Since the results show that pupils with decreased educational outcomes seem to spend not much time with their school friends, the negative effect of peers to educational outcomes is found from peers from own area. Thus, if a parent wants to regulate their childrens' peers, school does not seem to have a role in this- it is the neighbourhood where the family is living and the children living in the neighbourhood that might be transmitting (negative) pedagogical ethos to other children as well. This is an important result since the assumption of school effects can have a remarkable role in residential choices and when choosing a school to attend, which can further deepen the processes of socio-spatial segregation and school differentiation.

The results are significant from the perspective of urban and educational politics and planning. The indications that the educational outcomes in upper comprehensive schools in Helsinki are differentiated in neighbourhood level e.g. between Great districts, and in individual level between genders, challenge the goals of equal educational opportunities. Also, urban planning should be targeted to prevent socio-spatial differentiation of neighbourhoods, in order to combat differentiation in schools' composition of pupils.

In the chapter of Data and methods and in the end of Results chapter, some limitations of the data and trustworthiness of the study were evaluated. In further analysis, deeper examination of missing data should be made and consider the imputation of item nonresponse. That would enable to thoroughly look at large missingness in the data. However, despite the limitations of the study, these results can provide new knowledge from the perspective of urban research and education equality.

These results provide interesting further questions. In this research, the starting level of educational success (osaamistaso) was not considered. In future research, the starting level could be examined- does decrease in educational outcomes implicate different things for pupils that start with high starting level than pupils that have lower starting level in the beginning? Are there different "types" of pupils? Also, the consequences of decreased educational outcomes differ based on the starting level. For example, if the starting level in the beginning of upper comprehensive school is low and it further decreases, entering to upper secondary level education might be difficult.

In future research, having even more detailed data, such as place of residence, and reliable information on pupils' parents' socioeconomic background, would provide more comprehensive view on these mechanisms. Combining register information with survey data would be ideal. Moreover, combining qualitative and quantitative data would create a comprehensive understanding of this phenomena, since qualitative data could provide more insight with subjective views.

Also, having a truly longitudinal data with more than two data collection times would provide deeper knowledge to look at life or educational paths better: how does for example neighbourhood have an effect in long-term? Also, longitudinal data would help to study cumulative effects over time- what is the joint effect of different contexts during lifetime?

This study provided information that there are no differences between schools found at the moment, but the processes of segregation and differentiation are not stable, so the processes should be observed continuously.

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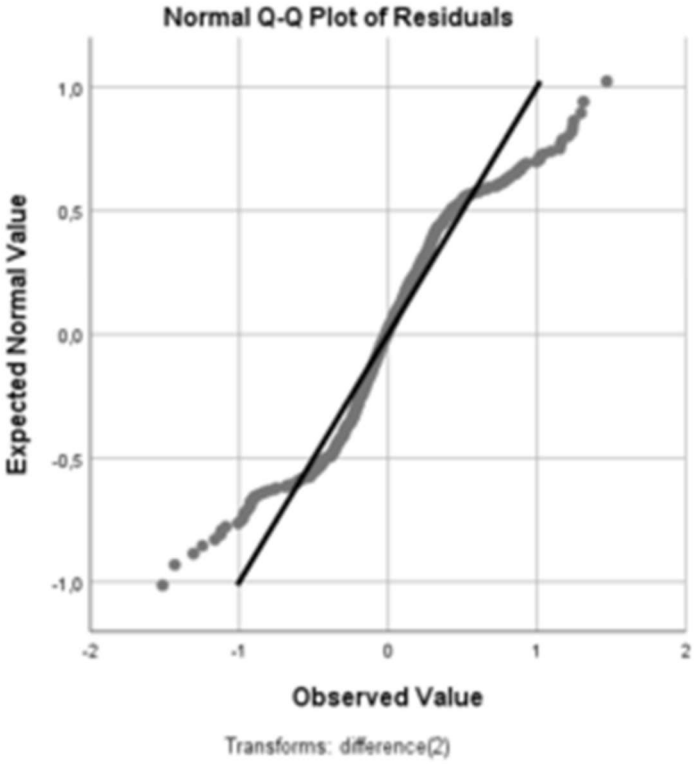
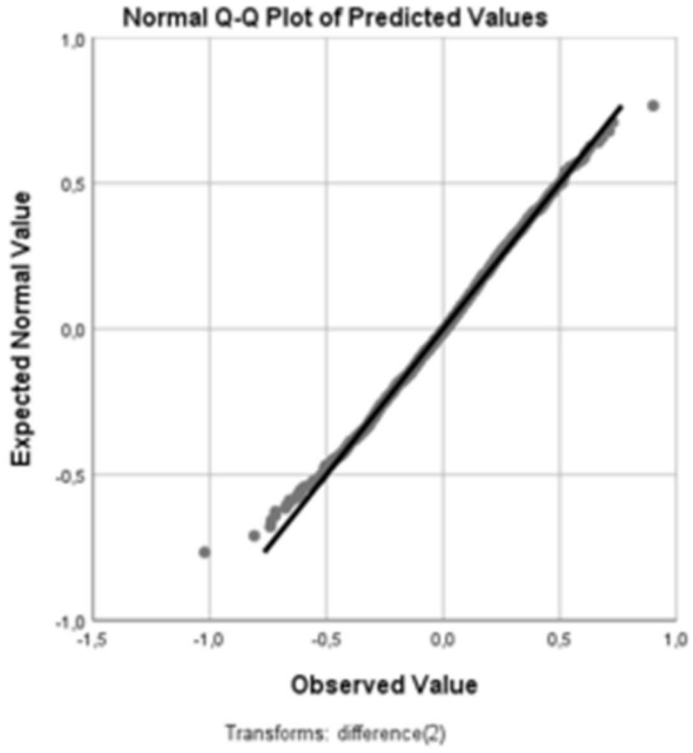
Appendices

	Factor 1: Achievement orientation	Factor 2: Learning and achivement orientation	Factor 3: Parents' pedagogical ethos	Factor 4: Peers' pedagogical ethos	Factor 5: Relationship with parents	Factor 6: Communality
How I am and my relationship with school: My parents value (arvostaa) schooling (koulunkäynti) very much			0.688			0.649
How I am and my relationship with school: My parents give their full support for my schooling			0.650			0.623
How I am and my relationship with school: My parents appreciate very much that one tries to learn and understand different things			0.617			0.568
At school and as a learner: My parents think I should try my best at school			0.439			0.453
How I am and my relationship with school: Relationship with my parents is very good.			0.430			0.400
How I am and my relationship with school: My friends are interested in the things thaught in school				0.732		0.781
How I am and my relationship with school: My friends value the knowledge and skills thaught in school				0.651		0.660
How I am and my relationship with school: In my friend group, schooling and learning are thought as important				0.616		0.648
How I am and my relationship with school: I discuss with mother or father of the things related to my schooling (koulunkäynti)					0.752	0.789
How I am and my relationship with school: I discuss with mother or father of the things that happened during my school day					0.732	0.669
At school and as a learner: It is an important goal for me to succeed well at school		0.681				0.691
At school and as a learner: It is an important goal for me to learn as much as possible at school		0.641				0.636
At school and as a learner: It is important for me to get good grades		0.630				0.592
At school and as a learner: My goal is to succeed well in my studying		0.622				0.652
At school and as a learner: Learning new things is the most important thing for me at school		0.564				0.553
At school and as a learner: I work hard to succeed at school	0.424	0.477				0.537

Appendix 1. Explorative factor analysis



Appendix 2. Residual of the final multilevel linear regression model



Appendix 3. Residual of the final multilevel linear regression model